9 DECEMBER 1954 NINEPENCE

# ELECTRICAL TIMES

The Owen Falls Hydro-electric Scheme will ultimately provide 700 million units of electricity a year, bringing light and power to many parts of East Africa. The many miles of power, distribution and control cables required for the first four generators of this great scheme were supplied by BICC and installed by the BIC Construction Company—Members of the BICC Group. One hundred and twenty route miles of 132kV overhead line are being erected by the same Company to carry power to Tororo and Kampala. This contract for the Uganda Electricity Board is typical of the work carried out by the BICC Group in power transmission and distribution, in many parts of the World.

*Consulting Engineers: Sir Alexander Gibb & Partners and Messrs. Kennedy & Donkin*

BICC

TRANSMISSION EQUIPMENT at OWEN FALLS

BRITISH INSULATED CALLENDER'S CABLES LIMITED
21, BLOOMSBURY STREET, LONDON, W.C.1

BI Callender's

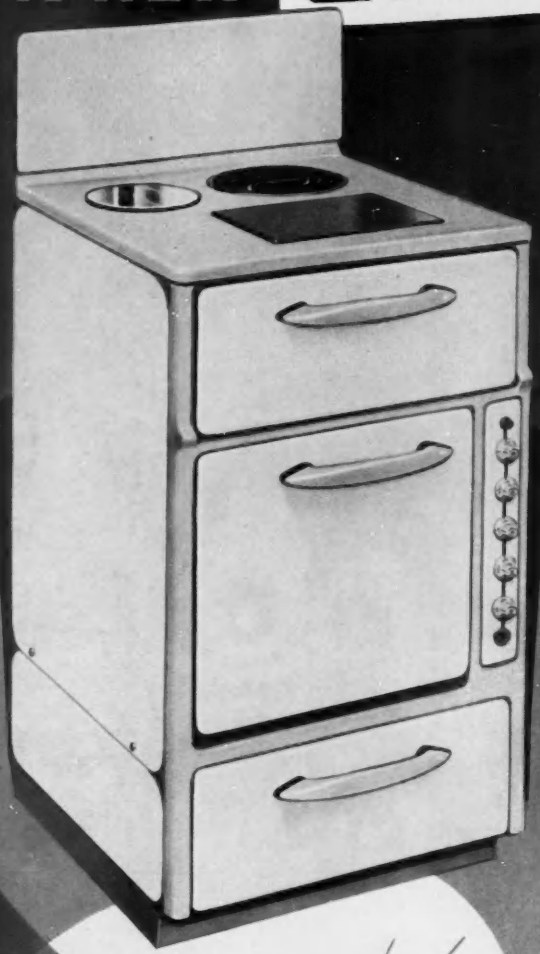
# A NEW LUXURY COOKER

*at a*

**COMPETITIVE PRICE**

*by*

# B·N·E



## Model C. 90

### Electric Cooker

With all the features of the popular C.49 — sound construction, cast iron main frame and hob, delightful colouring, drop down doors — PLUS

- ★ A 'New Look' to match its wonderful performance
- ★ Delightful pearl grey vitreous enamel interior
- ★ Heated Storage Drawer
- ★ Attention to every detail to ensure perfection
- ★ Pyrex glass Casserole/Grill-pan
- ★ and a quality of cooking that even surpasses the C.49

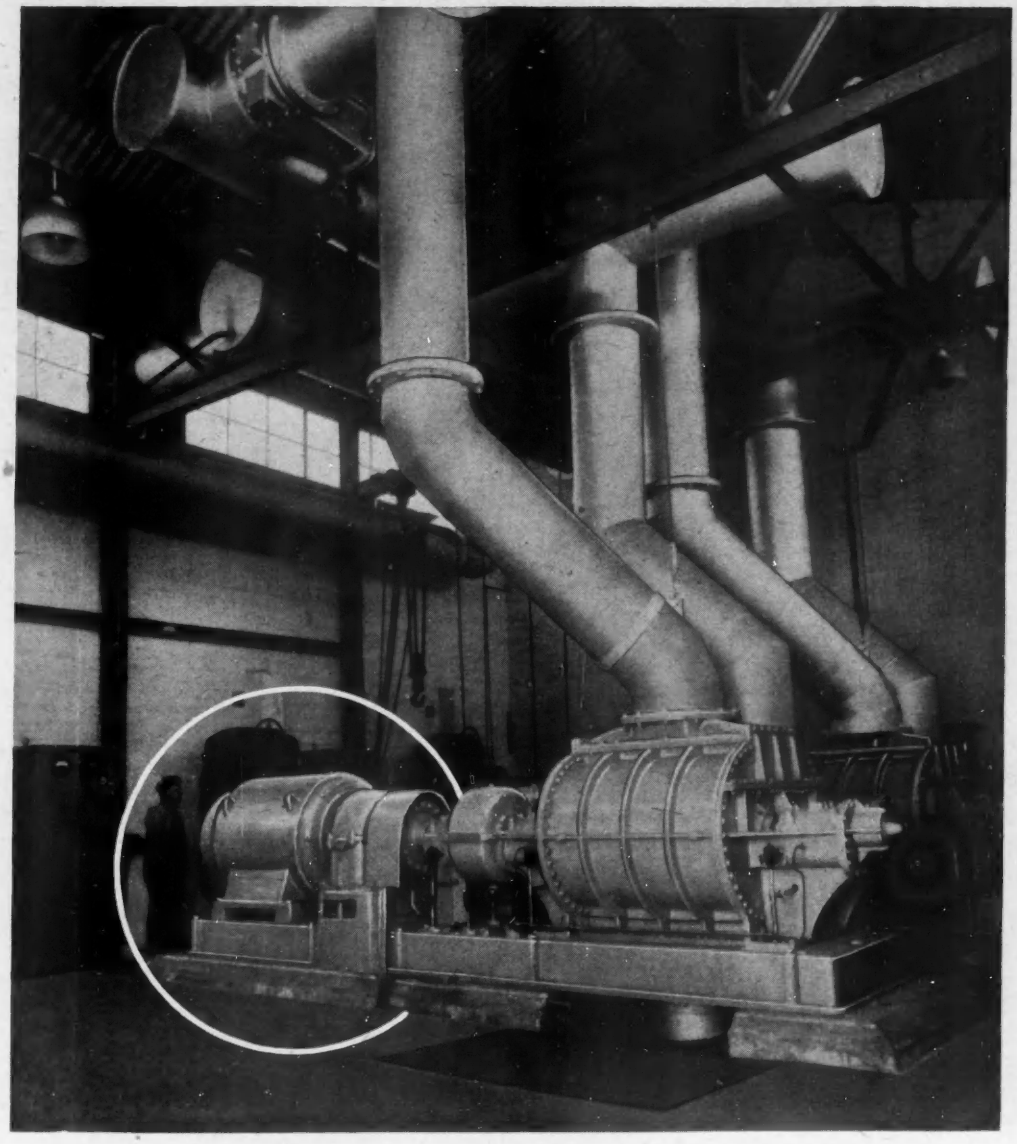
WITH THE AMAZING

**SPEEDHEAT OVEN**

HALVES PRE-HEATING TIME!

The Domestic Appliance Section of **JOHNSON & PHILLIPS LTD.,**

NEWARTHILL · MOTHERWELL · SCOTLAND



## L. S. E. motors are in service in the most productive circles

(Two 230/70 h.p. N-S variable speed a.c. motors driving blowers in an Australian fertilizer factory)

**LAURENCE, SCOTT & ELECTROMOTORS LTD.**

NORWICH, MANCHESTER, LONDON & BRANCHES

A

**Electricians & Instrument Mechanics WANTED**

**to spend FIFTEEN DAYS IN CAMP earning full pay and allowances plus a total of £9 TAX-FREE BOUNTY AND EFFICIENCY GRANT**

You can spend fifteen days with your friends, earning full Regular Army pay and allowances. As a member of the Army Emergency Reserve (Category IIA) you have no other duties during the year. If a grave national emergency should arise, you may be called up for service in the United Kingdom. You can be called out for overseas service only by Proclamation. Volunteers are accepted from 18 years of age and engagement is for two, three, or four years. If you have served before in a non-commissioned rank there is every possibility of your filling an existing vacancy or of being promoted as soon as a vacancy occurs.

**Lend your skill to Britain, doing the job you know best.**

**ARMY EMERGENCY RESERVE**

Send this coupon now for details of how to join to:
O.C. HEADQUARTERS, A.E.R.,
R.E.M.E., BROXHEAD HOUSE, BORDON

Name .....

Address .....

.....

508

# GENRISTO

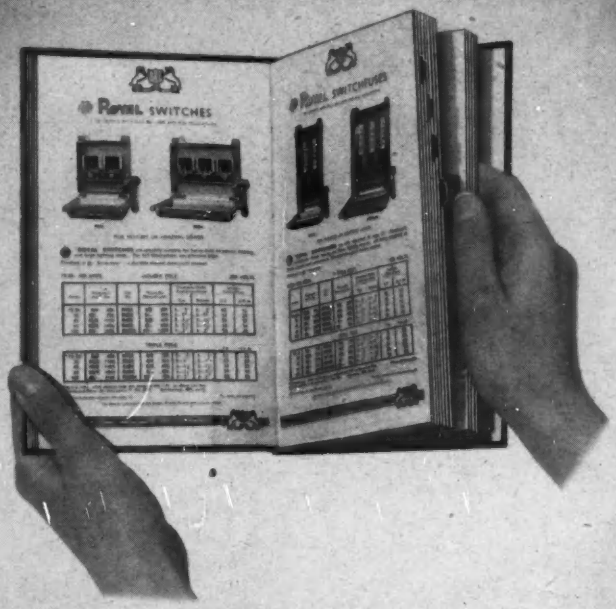
LTD.

OSMASTON STREET, NOTTINGHAM

*Boiling Plate*

850w—6" diameter
SOLID PLATE
EMBEDDED ELEMENT
Volts—200/10 and
230/50

*You cannot buy better gear*




BILL SWITCHGEAR CATALOGUE 12TH EDITION
ILLUSTRATES A COMPLETE RANGE OF
L.T. SWITCHES, SWITCHFUSES,
DISTRIBUTION BOARDS,
INDUSTRIAL PANELS, SWITCH-PLUGS AND SOCKET OUTLETS

WRITE FOR YOUR COPY.

**BILL SWITCHGEAR LTD.**
ASTON LANE · PERRY BARR
BIRMINGHAM·20

LONDON, S.W.1. A. W. ZELLEY, 61 PETER ST.
MIDLANDS. G. M. GARBETT, HEAD OFFICE.
NORTH MIDLANDS. C. G. BACHELOR, HEAD OFFICE.
CHELTENHAM C. GEARING, LECKHAMPTON HILL
MANCHESTER 3. H. H. POLLARD, WOOD STREET.
BRISTOL 3. W. L. WHITE, CHURCH LANE.
LEEDS 7. N. SHARPLES, 2 LOVELL RD.
GATESHEAD 8. S. J. DAVIS, 232 PRINCE CONSORT RD.
GLASGOW. J. D. HARRIS, ST. VINCENT LANE

# New lights on Industry

Not only are the Crompton 'New-Range' lighting fittings designed *for* industry, they have been designed *by* industry. Incorporating many improvements and new features that have been suggested by fluorescent lighting users themselves, they offer something completely new in fittings. They start as a foundation unit for one or two tubes, which may be quickly converted to any one of FIFTY-FOUR different designs to suit almost every contingency. Silent in action and equipped with the famous Crompton visible starter or snap start gear switch, the 'New-Range' fittings are finished in 'Permawhite' or vitreous enamel with reflectors in 'Permawhite', vitreous enamel or 'Perspex.' Write now for full informative literature.

BY APPOINTMENT MANUFACTURERS OF ELECTRIC LAMPS TO THE LATE KING GEORGE VI

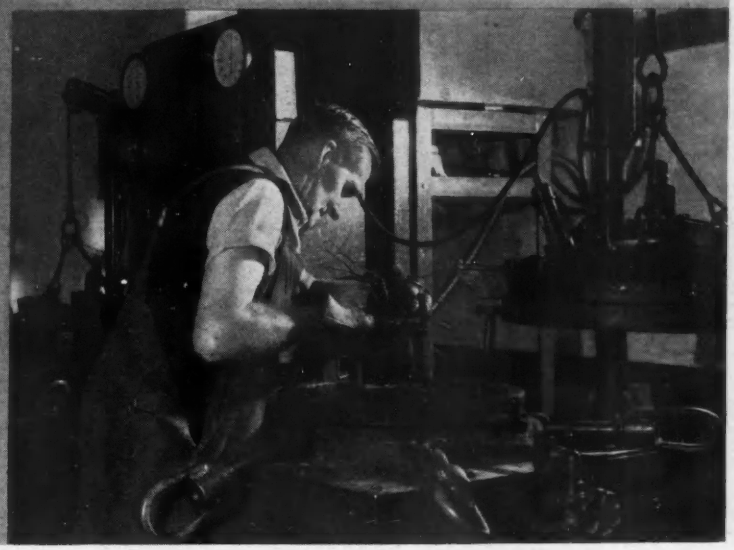
**Crompton 'NEW-RANGE'**

**The Lighting Fittings You Helped to Design**

ELECTRICAL EQUIPMENT

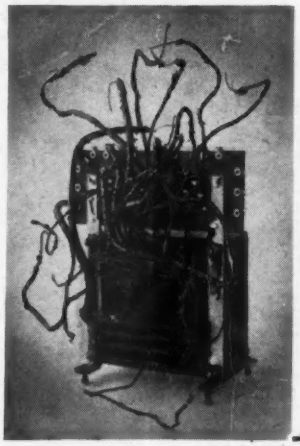
CROMPTON PARKINSON LTD., CROMPTON HOUSE, ALDWYCH, LONDON, W.C.2. TEL: CHANCERY 3333

# NOW outstanding heat resistance with Geon PVC



Permanoid VO sleeving, cables and covered wire are manufactured by Associated Technical Manufacturers Ltd.

*The illustrations show a stage in the manufacture of transformer coils by Associated Electronic Engineers Ltd.*



The leads from this Transformer — which is being removed from a vacuum impregnation plant — are covered with PERMANOID VO SLEEVING. This is made from specially compounded *Geon PVC incorporating *Diolpate*, a plasticizer which is *non-ageing, non-migratory and non-extractable.*

This varnish impregnation process — which involves heating at 135°C. for over 24 hours . . . and 30 minutes under vacuum — has no adverse effect on the PVC sleeving. There is no loss of flexibility or electrical properties in spite of this drastic treatment. The combination of Diolpate plasticizer with Geon PVC gives outstanding resistance to heat and ensures that full flexibility is permanently retained.

Geon Polyvinyl Materials

*Geon materials are polyvinyl chloride plastics. Ask for descriptive Booklet No. 97 free on request.

*"Geon" is a registered Trade Mark.

**BRITISH GEON LIMITED**

SALES AND TECHNICAL SERVICE

Devonshire House, Piccadilly, London W.1 *Telephone: Mayfair 8867*

# SPARTAK play under REVO FLOODLIGHTS

## *Russian players train at Tipton*

Because of the excellent facilities provided by the Revo Electric Company's Floodlit Sports Arena at Tipton, the Russian Spartak team selected this ground to carry out their training (in preparation for their match with Wolverhampton Wanderers) and found the lighting to their entire satisfaction.

The experience of close on half a century in the manufacture and design of lighting equipment enables the Revo Electric Co. Ltd., to offer a first-class service and many leading clubs throughout the country have chosen Revo Floodlights to illuminate their grounds.

The company's technical staff is available to advise on all aspects of floodlighting and details and catalogues will gladly be sent to interested authorities who are invited to forward their enquiries without obligation.

*(Top) Wolverhampton Wanderers playing Revo Electric Co. Ltd., on the latter's own ground.*

*(Centre and below) Members of the Russian team taken during their training under Revo Floodlights.*

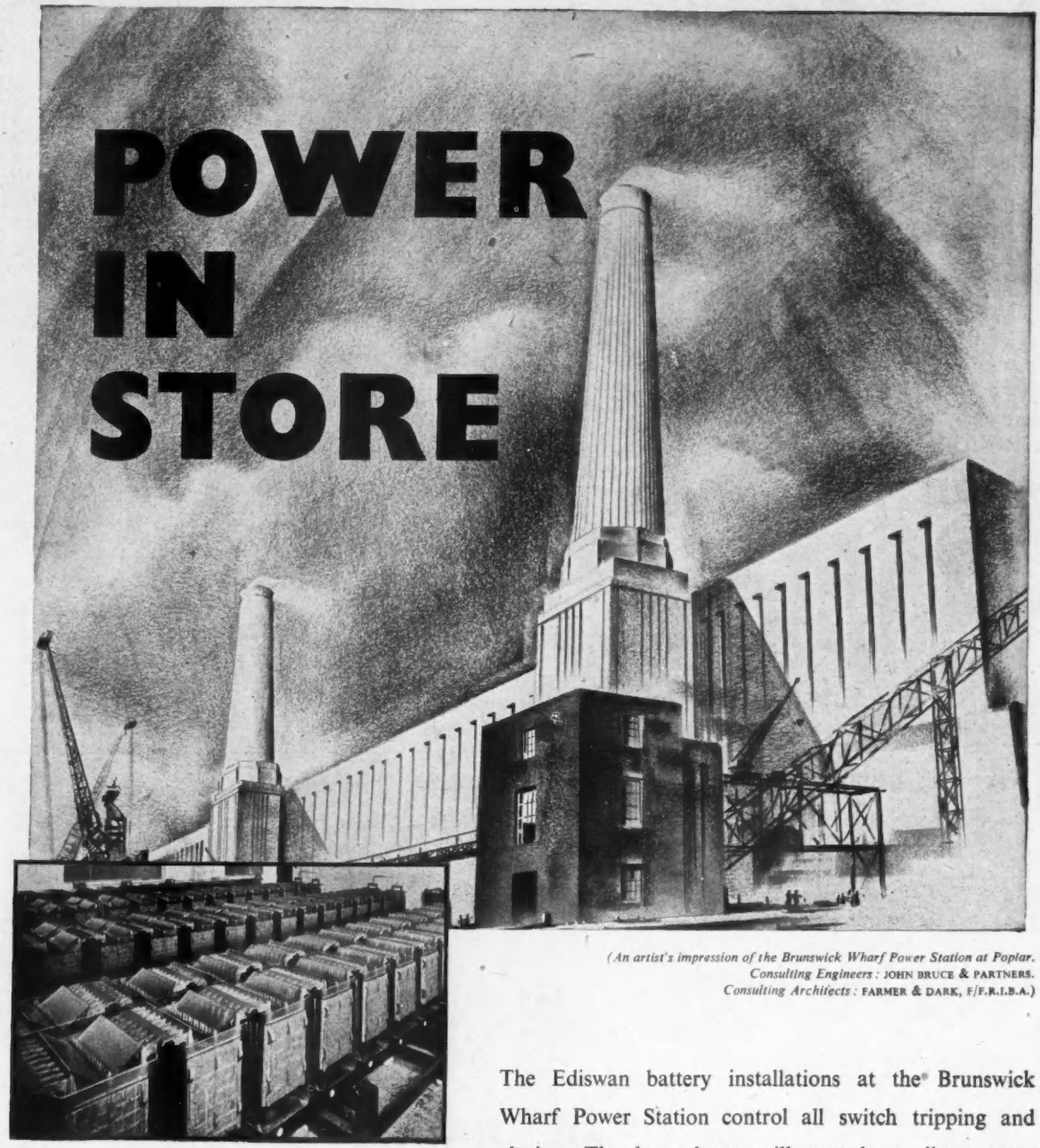
REVO REGD.

## FLOODLIGHT EQUIPMENT

**REVO ELECTRIC CO. LIMITED, TIPTON, STAFFS., ENGLAND**

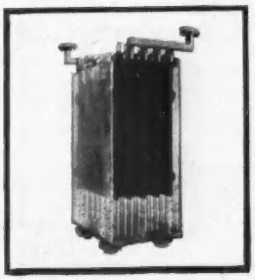
Branches at LONDON, MANCHESTER, GLASGOW, LEEDS, CARDIFF, NEWCASTLE-on-TYNE, BELFAST, DUBLIN

Makers of: Cookers, Domestic Appliances, Public and Industrial Lighting, Switch-gear, Electric Fans




*(An artist's impression of the Brunswick Wharf Power Station at Poplar.*
*Consulting Engineers:* JOHN BRUCE & PARTNERS.
*Consulting Architects:* FARMER & DARK, F/F.R.I.B.A.)

The Ediswan battery installations at the Brunswick Wharf Power Station control all switch tripping and closing. The large battery illustrated supplies current for switch-closing, emergency lighting and D.C. motors. Four smaller batteries (see below) provide for the operation of air-blast and oil-circuit breakers, panel indication lamps and telecommunication equipment.



# EDISWAN
## Stationary Batteries

**THE EDISON SWAN ELECTRIC CO. LTD · 155 CHARING CROSS ROAD · LONDON, W.C.2**

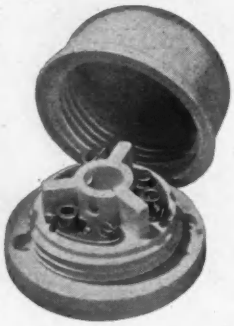
*Works: Ponders End, Middlesex*

*Member of the A.E.I. Group of Companies*

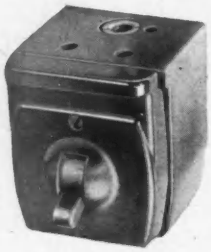
## Further Illustrations

From our range of over 300

ELECTRICAL ACCESSORIES



Porcelain Ceiling Rose



Top Entry
Porcelain Switched
Socket

**CLANG**

REGISTERED TRADE MARK

CRICKLEWOOD - LONDON

'Phone Gladstone 4201—P.B.X. Board

# AUTOMATIC

## STREET LIGHTING CONTROL

The up-to-date Fluorescent Lighting Scheme installed at Holborn is controlled by Horstmann Type "Q" Time Switches.
The time switch is designed to control two circuits and it can be arranged to reduce main lighting at or about midnight when traffic is less and full lighting is not essential, and finally to switch OFF at dawn.

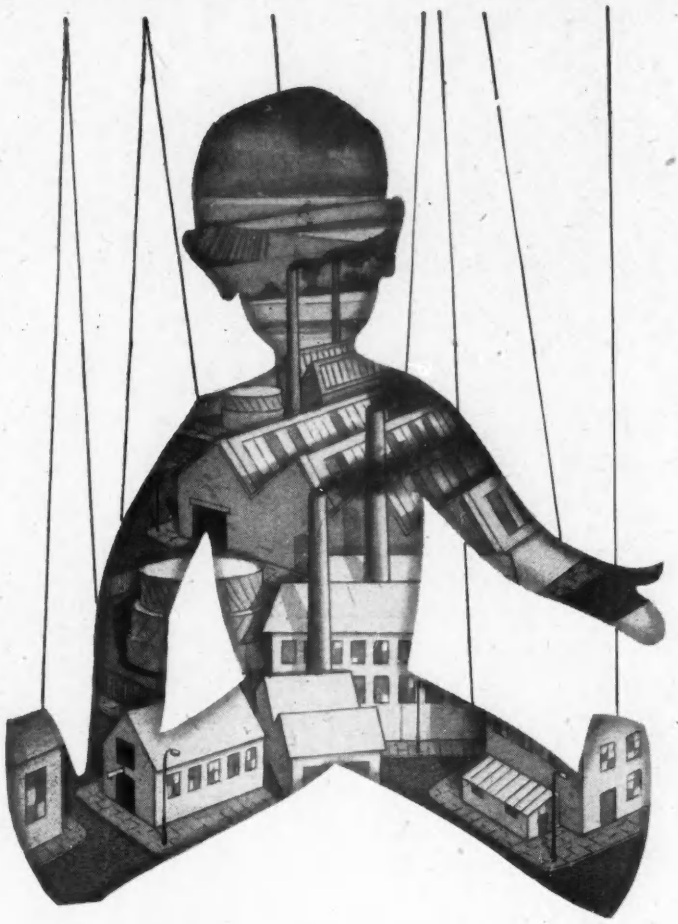
A full range of HORSTMANN Time Switches is available to meet all the demands of modern public lighting control, and 50 years of design and manufacturing experience ensures unfailing reliability under varying conditions of service.

**HORSTMANN**

*Photograph by courtesy of the General Electric Company Ltd.*

THE HORSTMANN GEAR CO LTD

NEWBRIDGE WORKS, BATH, ENGLAND. TEL: 7241



# The supply of power to industry . . .

***Since 1895 . . .*** The Supply of Power to Industry by electricity has depended upon the safe and enduring qualities of the electric cables. Well known to engineers for their superb performance and reliability CONNOLLYS' Paper Insulated Power Cables have "grown-up" with the mighty giant of Electric Power. Many Area Electricity Boards, Collieries and Railways rely on CONNOLLYS' Cables knowing that in our modern factory we, ourselves, carry through every stage of manufacture from wire-drawing, to final testing.

CONNOLLYS' Paper Insulated Power Cables are produced to British Standards and other specifications from 660 to 11,000 volts. Special finishes can be manufactured to customers' own requirements.

## CONNOLLYS (BLACKLEY) LIMITED

*Founder members of the C.M.A.*

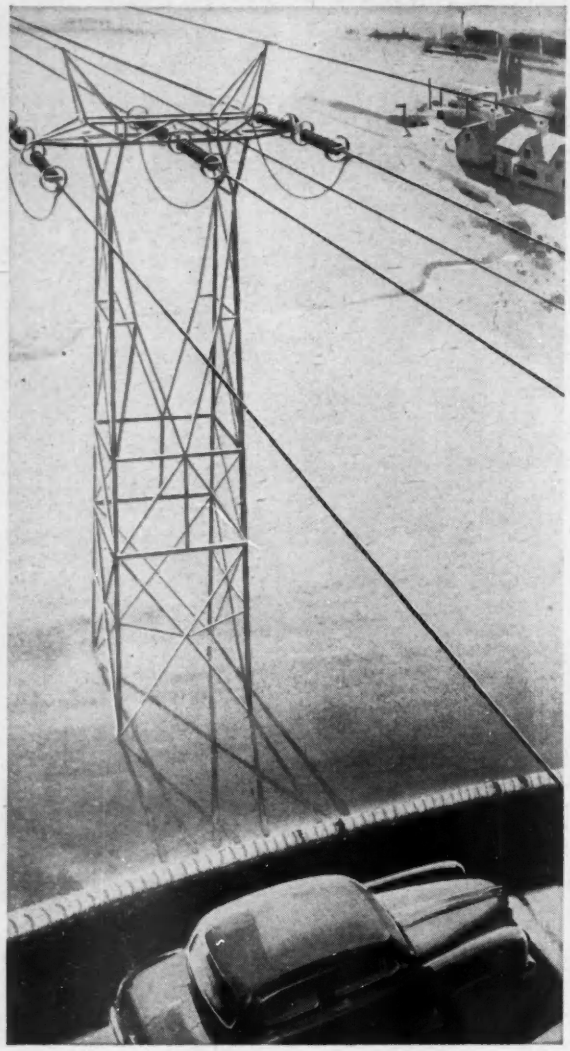
**HEAD OFFICE: MANCHESTER 9**

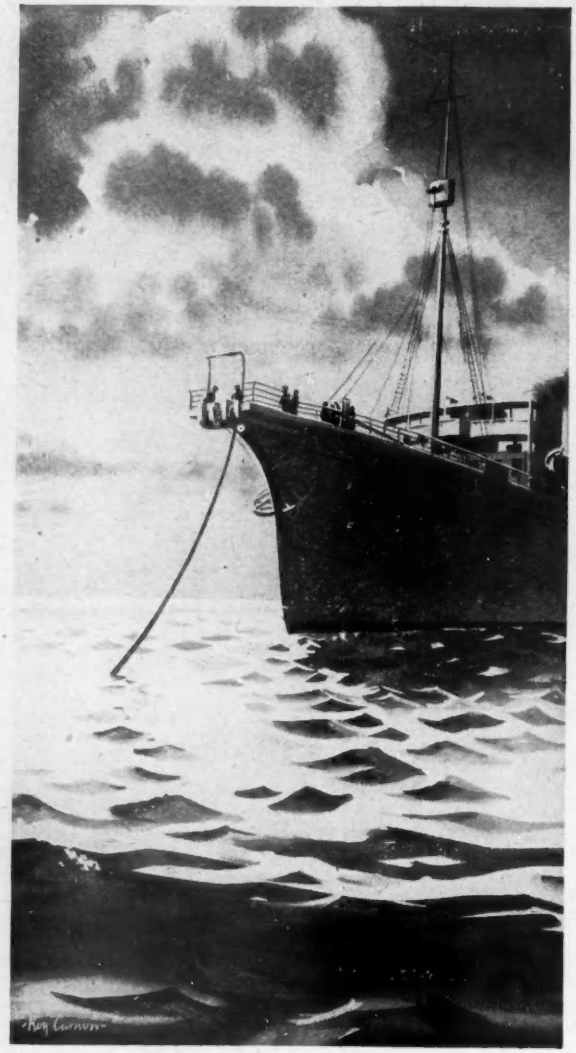
**Phone: CHEetham Hill 1801** **Grams: "Connollys Blackley"**

Southern Sales Office and Stores :
23 Starcross Street, London, N.W.1
Tel : EUSton 6122

Birmingham Office :
15-17 Spiceal Street, BIRMINGHAM 5
Tel : Midland 2268

# ALUMINIUM AT WORK





## From the familiar . . . . . to the less familiar

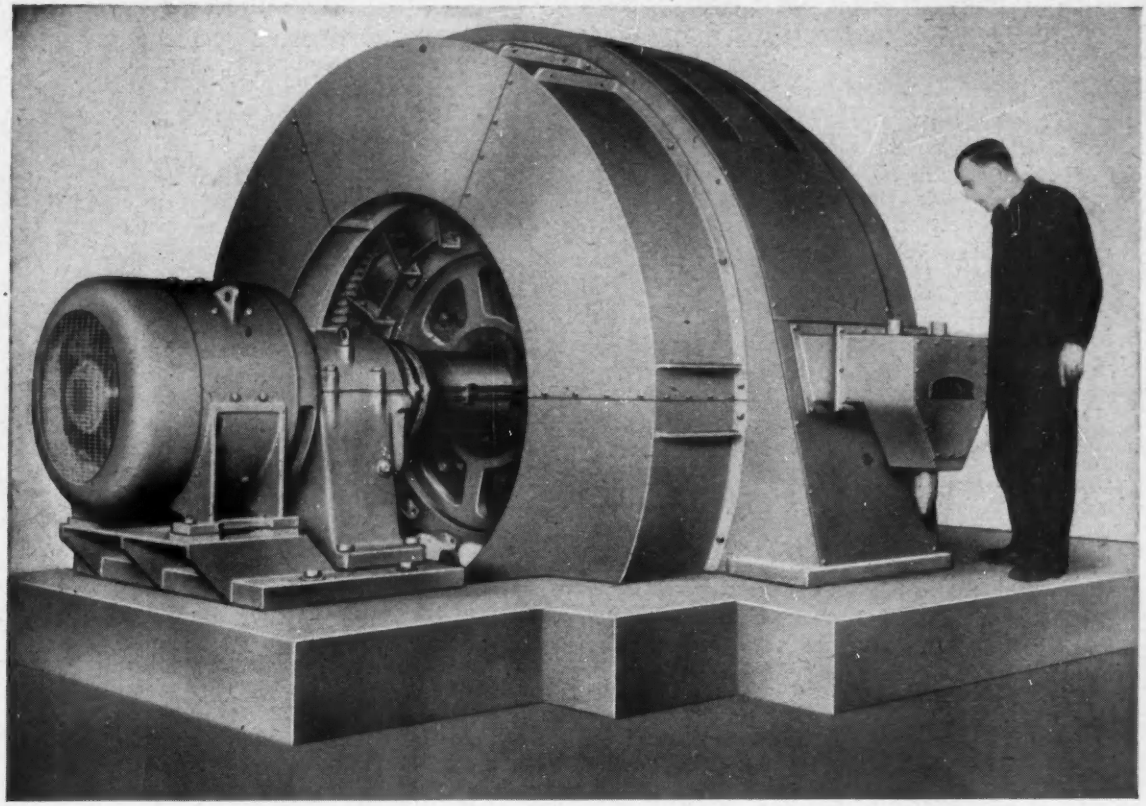
Smog or sea mist, tropic rain or arctic blizzard—aluminium transmission lines stand up to them all. Year in, year out, the remarkable durability of aluminium ensures a dependable power supply with the minimum of maintenance. No wonder more and more aluminium is being put to work wherever such chemical stability counts. In submarine cable systems, for example. Wherever, in fact, reliability is vital, and constant maintenance and inspection costly or impractical. Just think for a moment: is aluminium working for you?

**Aluminium Union Limited**

*(Incorporated in Canada)*

THE ADELPHI, JOHN ADAM STREET, LONDON, W.C.2 *An ALUMINIUM LIMITED Company*

OFFICES, ASSOCIATED COMPANIES AND AGENTS THROUGHOUT THE WORLD



# For efficient power generation

Brush Alternators embody the results of the extensive experience which the Company has built up during the past 70 years in the design and manufacture of electrical rotating machinery, and complete generating plant for large power stations.

The machine illustrated, which embodies robust fabricated construction, has an output of 2,500 kVA — 11,000 volts at 428 r.p.m., and is one of a number of Brush Alternators built for the Isle of Man Power Station.

**We are in a position to offer quick delivery of a range of our large Alternators and also synchronous Motors, full details of which will be sent on request.**

Our full range covers outputs of 3 to 3,000 kVA.

*Alternators by* BRUSH

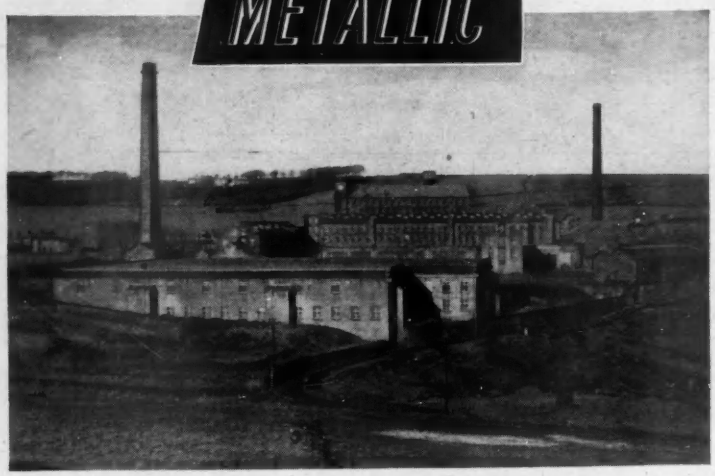
BRUSH ELECTRICAL ENGINEERING CO., LTD., LOUGHBOROUGH, ENGLAND

Birmingham · Bristol · Cardiff · Glasgow · Ipswich · Leeds · London · Manchester · Newcastle · Sheffield

B.13

**CONDUIT & FITTINGS SUPPLIED BY**

METALLIC



*Denholme Mills, Nr. Keighley.*
*Photo by courtesy of*
*W. & H. Foster Ltd.*

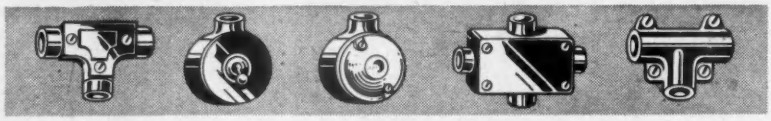
*Electrical Contractors:*
*A. R. Farrar & Co., Ltd., Bradford.*

A TI COMPANY

It may be a School, it may be a Factory—a Power Station or a Housing Estate, but more often than not the electrical specification will be—METALLIC.

This Yorkshire Mill is no exception, being fitted throughout with METALLIC Conduit and Fittings—unequalled for quality and consistent accuracy.

***THE METALLIC SEAMLESS TUBE CO. LTD.***
**LUDGATE HILL · BIRMINGHAM · 3**



ALSO AT LONDON · NEWCASTLE-ON-TYNE · LEEDS · SWANSEA & GLASGOW

# *It's an awkward position but an* EASY FIXING

Here, as in every fixing job, there's only one way to ease, speed and efficiency—Rawlplug Fixing Devices and Tools.
Did you know that there is a Rawlplug for every size screw right up to ⅜" diam. Coach Screws? Rawlbolts too run from $\frac{3}{16}$" to 1" diam., ample strength for really heavy bolt fixings, and *no waiting for cement to dry!* For speedy hole-boring use Rawlplug Tools—Durium-tipped masonry Drills, Kango hammers, Pneumatic Hammer Tools and many others. They all save time, make the job easier—and save money.
*Write our Technical Dept. for free advice on* your *fixing problem*

THE RAWLPLUG COMPANY LTD.

RAWLPLUGS WALL PLUGS

CROMWELL ROAD LONDON, S.W.7

**THE WORLD-WIDE FIXING DEVICES ORGANISATION**

8487

*Rawlplugs, Rawltools, Rawlbolts, Rawltamps, Rawlnuts, Bolt Anchors, Screw Anchors, White Bronze Plugs, Rawltoggles, Rawlclips, Cement in Sockets, Durium Drills and Hole Boring Tools for Hand, Electric Hammer or Pneumatic Hammer operation.*

# *Just add it up—*

## HERE IS YOUR NEW MASS MARKET

| | £ | s. | d. |
|---|---|---|---|
| *Philips A.6290 "AYR" Fitting* | 2 | 13 | 0 |
| *Philips MCFB/U 4' 40 watt fluorescent lamp* | | 15 | 8 |
| *Philips tungsten ballast internal reflector bowl lamp* | | 5 | 0½ |

**SELLS COMPLETE FOR ONLY £3·13·8½ TAX PAID**

★ ★ ★ ★ ★ ★ ★ ★

That's all you need with Philips "Gear-less" Lighting—just the three items listed above. Then you've got yourself a completely new market — a new mass market for inexpensive fluorescent lighting in shops, offices, display work, for all sorts of commercial and industrial uses ! There's simply nothing to compare with this revolutionary lighting achievement from Philips. No other lighting can offer anything like so many advantages at such phenomenally low cost !

### OVERWHELMING ADVANTAGES

Lowest priced fluorescent lighting · Fluorescent lamp and filament lamp can be fixed separately or together, as desired · Absolutely noiseless in operation · Very light weight · No control gear or starter switch required · With Deluxe Warm White lamp gives perfect colour rendering for the display of food · Light equal to two 100 watt filament lamps for only 115 watts.

## "Gear-less" LIGHTING *from* PHILIPS

PHILIPS

**PHILIPS ELECTRICAL LIMITED**

Lighting Division, Century House, Shaftesbury Avenue, London, W.C.2

TUNGSTEN, FLUORESCENT, BLENDED AND DISCHARGE LAMPS · LIGHTING EQUIPMENT · RADIO AND TELEVISION RECEIVERS

(776)

# ★Heavy Duty

★3 CORE ·1 sq. in. V.R. insulated, armoured 3·3 kV. power cable for export.

Vulcanised Rubber, Varnished Cambric and Thermoplastic Insulated L.T. and H.T. Cables

# MERSEY CABLES

## ARE USED THROUGHOUT THE WORLD

**MERSEY CABLE WORKS LTD • LINACRE LANE • BOOTLE • LIVERPOOL 20.**

*Telephone: Bootle 4111 (4 lines)*

*Telegrams: "MERCABLES, LIVERPOOL 20".*

A TI COMPANY

***The standard of quality and performance the world over***

**All listed Fuse Links available ex stock**

# 'ENGLISH ELECTRIC'

## h.r.c. fuse links

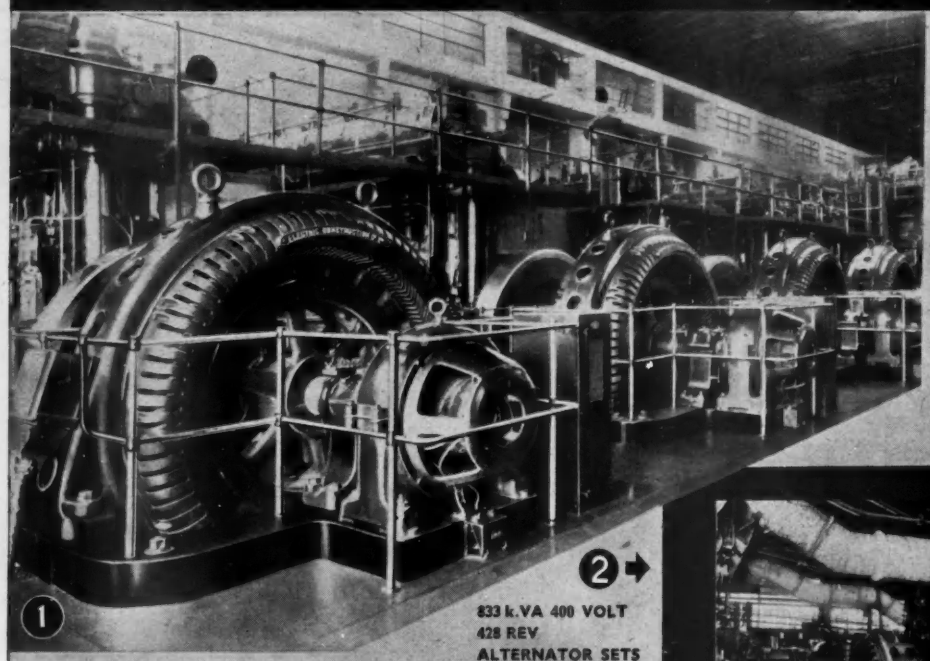
THE ENGLISH ELECTRIC COMPANY LIMITED, QUEENS HOUSE, KINGSWAY, LONDON, W.C.2

*Fusegear Works, East Lancashire Road, Liverpool 10*

WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

F.9

# ENGINE-DRIVEN ALTERNATORS



1

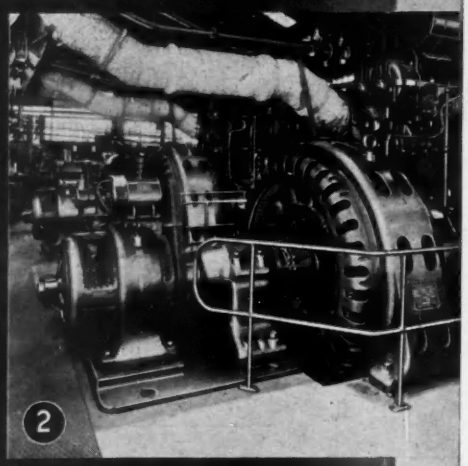
← 1

6kV DIESEL-ENGINE DRIVEN ALTERNATOR SETS AT THE QUEEN'S ROAD (ST. HELIER) GENERATING STATION OF THE JERSEY ELECTRICITY SUPPLY COMPANY LTD.

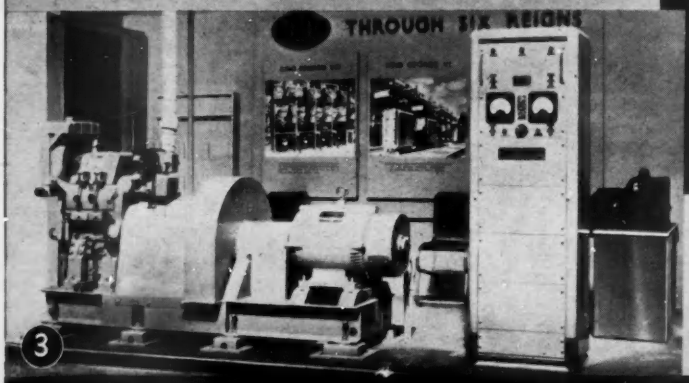
2 →

833 k.VA 400 VOLT 428 REV ALTERNATOR SETS OPERATING IN THE POWER HOUSE AT THE WORKS OF MESSRS. BLACKSTONE & COMPANY LTD.

*Brochure B1720 "ECC ALTERNATORS" Available on request*



2




3

← 3

A 5kW continuity engine alternator set with special NO-BREAK feature specially designed for telecommunications and other essential services (Brochure B1739 gives full details.)

ESTABLISHED 1882

## THE ELECTRIC CONSTRUCTION COMPANY LTD.

TELEGRAMS: ELECTRIC WOLVERHAMPTON

Head Office and Works: BUSHBURY ENGINEERING WORKS WOLVERHAMPTON ENGLAND

TELEPHONE: WOLVERHAMPTON 21455 (7 LINES)

2680

*Manufacturers of Rotating Electrical Machinery, Switch and Control Gear, Rectifiers and Transformers.*

District Office for London and The Southern Counties, "BUSHBURY HOUSE," 57 BUCKINGHAM GATE, LONDON, S.W.1
*Telephone: VICTORIA 3482/3*

# MINING CABLES

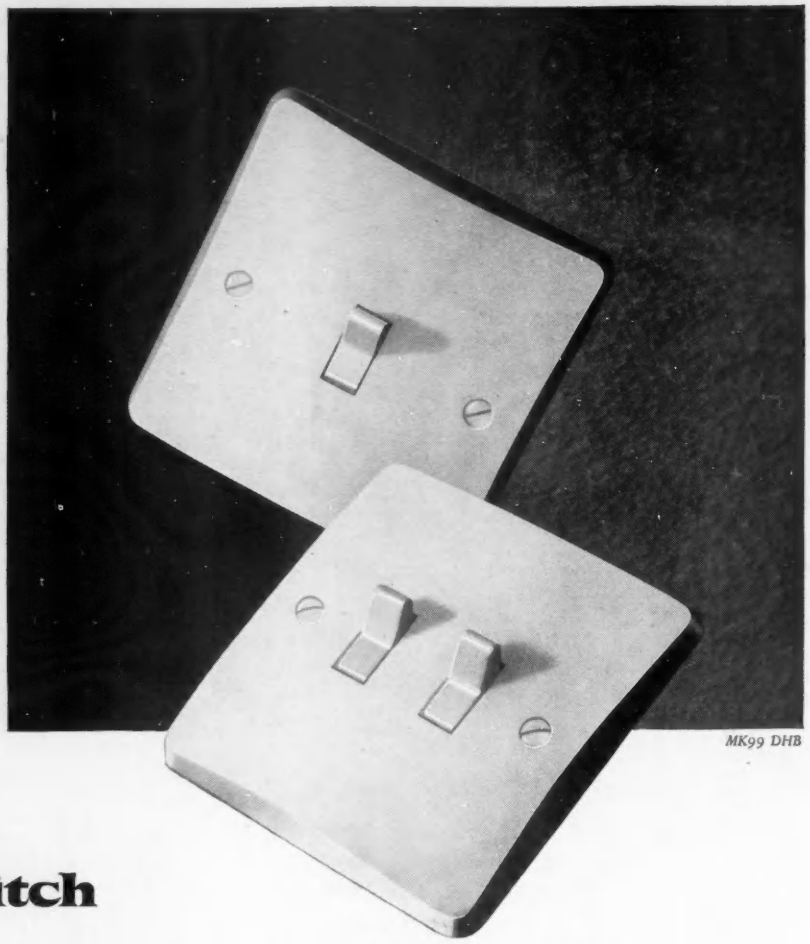
*for*
**DRILLS**
**CUTTERS**
**CONVEYORS**
**AND**
**COMMUNICATIONS**

by HENLEY

W. T. HENLEY'S TELEGRAPH WORKS COMPANY LIMITED, 51-53 HATTON GARDEN, LONDON, E.C.1

B

**for modern housing**



MK99 DHB

# *the* **Plateswitch**

*. . . setting new standards in value and reliability*

Every detail of the distinctive new **Plateswitch** is worth studying. The quality of the materials and the finish bear the closest possible inspection. Installation is made easier by provision for automatic levelling with the plaster and generous and well-positioned terminals. Both one and two gang patterns have BS 1299 fixing centres. The action is positive, yet the **Plateswitch** is easily operated in silence. In its clean modern lines, too, the **Plateswitch** is right up to the minute.

**THESE EXTRA ADVANTAGES SIMPLIFY STOCKING**

★ Every **Plateswitch** is supplied with four screws to match—two 4BA for metal boxes and two No. 5 wood screws for wood boxes.

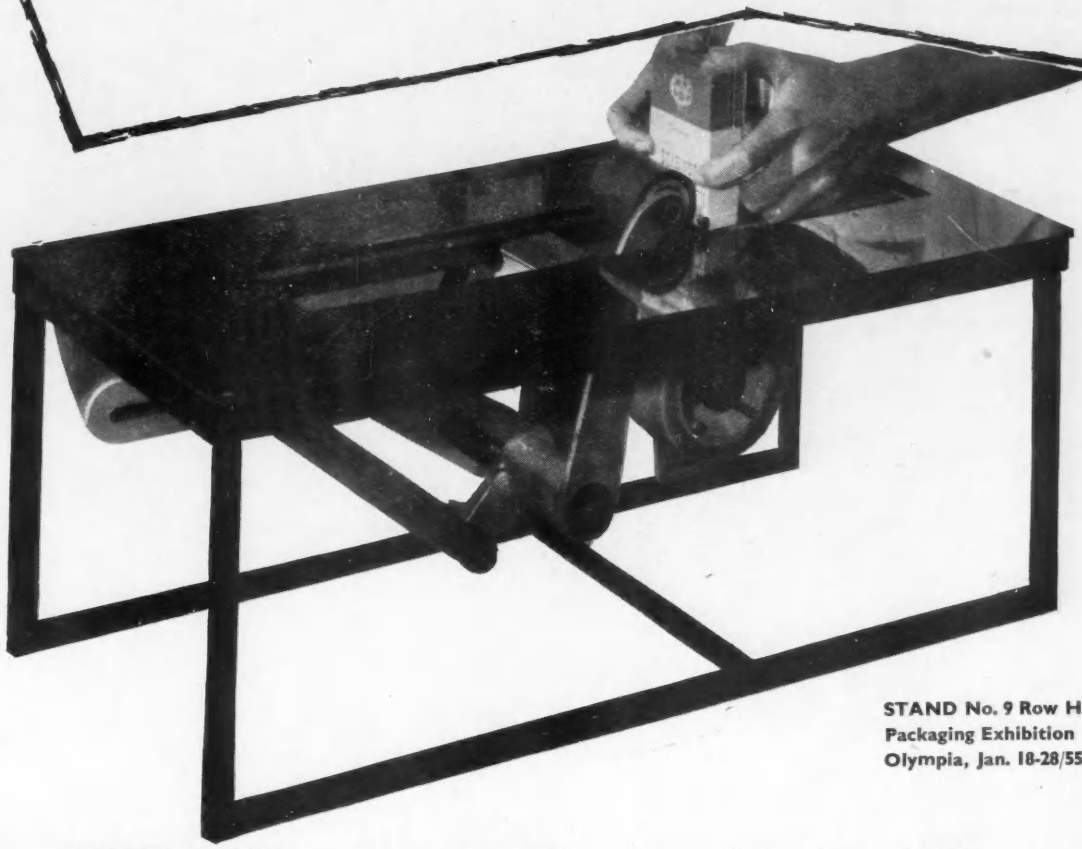
★ The two gang **Plateswitch** has two 2-way switches only, each or both of which can be wired as 1-way.

*Ask for leaflet 227 and compare the value.*

MK *. . . the mark of leadership*

M. K. ELECTRIC LIMITED, WAKEFIELD STREET, LONDON, N.18. *EDMONTON 5151*

# a new Permacel packaging aid



**STAND No. 9 Row H**
**Packaging Exhibition**
**Olympia, Jan. 18-28/55**

## The PERMACEL corner sealer for 2-inch width tape

TRADE MARK

One swift, flowing movement is all that is needed to seal the end of a box or package with the Permacel Corner Sealer. The package is placed on a small movable platform, baize-covered to protect the package, and is moved forward over a rubber roller which presses the tape firmly into position. Adjustable roller height—to ensure maximum adhesion ; adjustable curved plate and metal tongue—to keep the package upright are additional features of this sturdy little machine. Besides taking any *width* of Permacel Cellulose or PVC (unplasticised) self-adhesive tape up to 2 inches, the *length* of the strips dispensed can be varied, 5 inches being the maximum. Send for more details of the Permacel Corner Sealer and learn more about the new way to save time and money in packaging. Enquiries to Dept. ET, Industrial Sales Division.

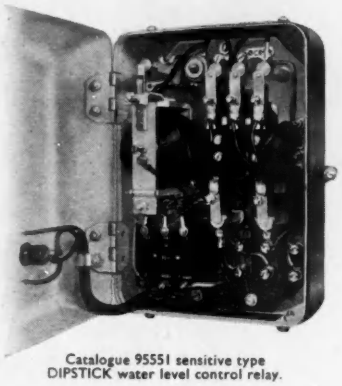
**Permacel**
TRADE MARK
**SELF-ADHESIVE TAPES**

Johnson & Johnson (G.B.) LTD., SLOUGH, BUCKS
*Tel: Slough 25521 (8 lines)*

16-12A

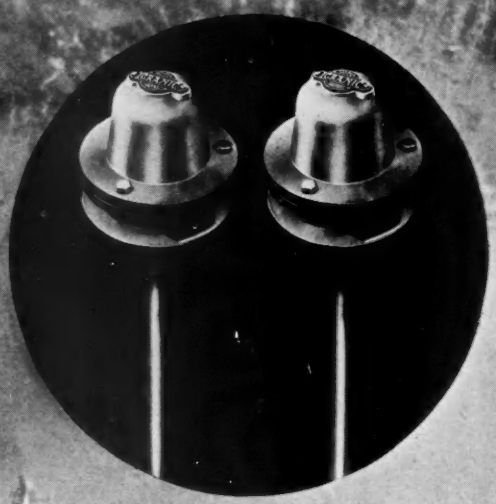
# taking the rough with the smooth

There is nothing temperamental about Igranic water level control. It takes the rough with the smooth and operates equally positively no matter how turbulent the conditions. For accurate, trouble-free service wherever automatic operation on changes of water level is required, Igranic DIPSTICK water level control provides a ready solution to all problems.



Catalogue 95551 sensitive type DIPSTICK water level control relay.

## DIPSTICK WATER LEVEL CONTROL



The electrode holders are substantially designed with cast iron body and robust moulded insulators.

MOTOR IGRANIC CONTROL

**IGRANIC ELECTRIC CO LTD HEAD OFFICE AND WORKS BEDFORD**

*EXPORT DEPT VICTORIA STATION HOUSE 191 VICTORIA STREET LONDON SW1 CABLEGRAMS IGRANIC LONDON*

**BRANCH OFFICES LONDON BIRMINGHAM BRISTOL CARDIFF EAST ANGLIA GLASGOW LEEDS MANCHESTER NEWCASTLE SHEFFIELD**

(ONE OF THE METAL INDUSTRIES GROUP OF COMPANIES)

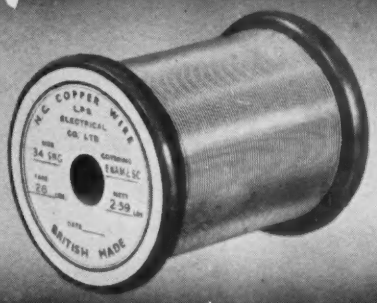
IG3/363

For all industrial distribution problems consult the G.E.C. whose technical staff are always available to draw up specifications to meet individual requirements. Write for a copy of publication C.1877 (G.E.C. Industrial Metalclad Distribution Systems).

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

# Dependability

INSTRUMENT WIRES
STRANDS & BRAIDS

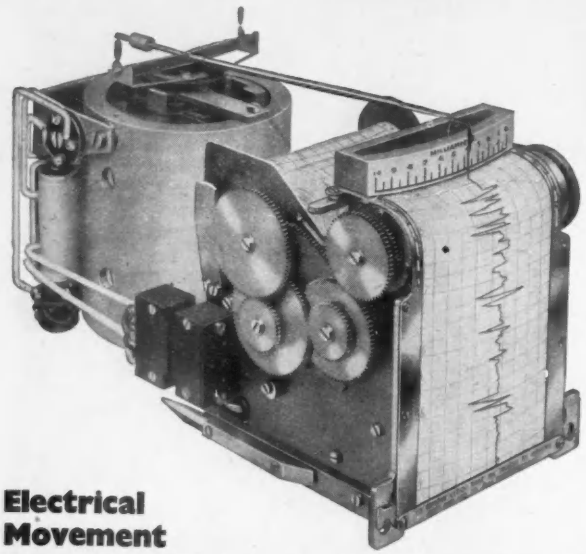



TELEPHONE & RADIO CORDS
CABLES & FLEXIBLES

**LPS**
ELECTRICAL CO.LTD

ALPERTON WEMBLEY MIDDLESEX
TELEPHONE : PERIVALE 5621-4 TELEGRAMS : ENGINEYOR PHONE LONDON

---



RECORD **GRAPHIC RECORDER**

★ for accuracy

★ speed of response

★ exceptional sensitivity

★ compactness without sacrificing chart visibility

**Electrical Movement**

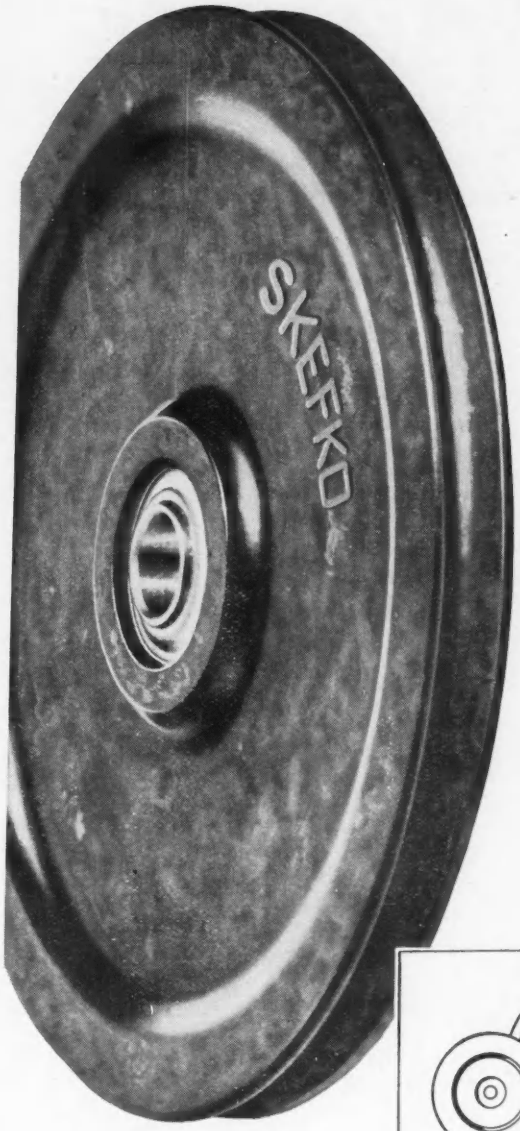
Generously proportioned, giving high torque for low consumption.

**Chart Mechanism**

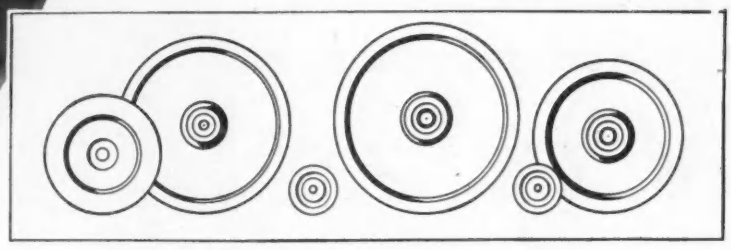
Compact, removable without disturbing the electrical movement and can be re-loaded with ease and safety.
Available over the full range of power requirements and tachometers. Also available in special forms for telecommunication and electronic service. Standard designs for Switchboard mounting or portable work are available for quick delivery.

**THE RECORD ELECTRICAL COMPANY LIMITED**
BROADHEATH · ALTRINCHAM · CHESHIRE

# They're lively lads at Lorival . . .




Plastic and hard rubber mouldings often make good products better and even cheaper. Lorival have made many precision mouldings which are lighter and stronger than the original materials. Mass production of accurate, uniform plastics has saved thousands of hours of machining time. Skefko ball bearing control pulleys, standard equipment on Service aircraft and civil airliners, are a good example. For more than fourteen years, they have given reliable service in planes of every type. Made in fabric-filled phenolic material, they are strong, exact and concentric. The Skefko ball bearing is moulded in by a Lorival patent process.
A full range to SBAC standards is manufactured

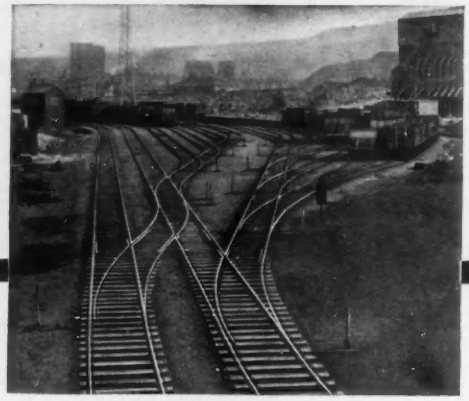


## LORIVAL PLASTICS

UNITED EBONITE & LORIVAL LTD · LITTLE LEVER · NEAR BOLTON · LANCS

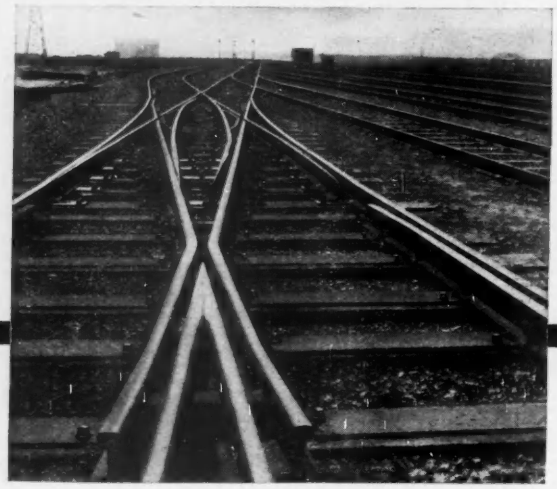
L45

# WARD-BUILT RAILWAY SIDINGS



Backed by the experience of over half-a-century, Wards' service to industry covers all aspects of railway siding planning, construction and maintenance, including earth moving and site preparation.

Photographs of recent 'Ward-built' sidings, at (above) Dorman Long & Co. Ltd.'s new blast furnace at Clay Lane, Middlesbrough; (left) Point of Ayr Colliery (reproduced by permission of the N.C.B.) and (below) Dorman Long and Co. Ltd., Lackenby Steel Plant, Middlesbrough.



The third edition of our booklet 'Rails and Rail Accessories' is now available. Copies will be forwarded on request.

## THOS. W. WARD LIMITED

ALBION WORKS · SHEFFIELD

TELEPHONE: 26311 (22 LINES) · TELEGRAMS: "FORWARD · SHEFFIELD"

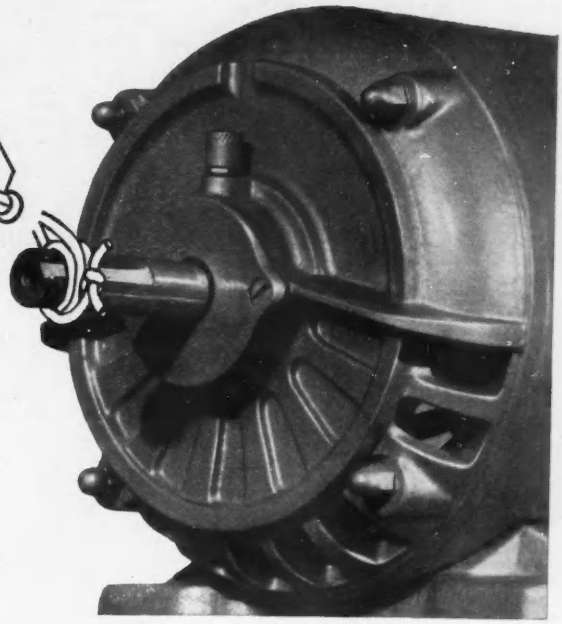
LONDON OFFICE: BRETTENHAM HOUSE · LANCASTER PLACE · STRAND · W.C.2

SC.35.

# FACTS ABOUT ELECTRIC MOTORS

STANDARD PROTECTED WITH FEET

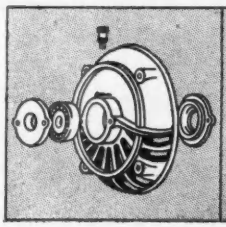
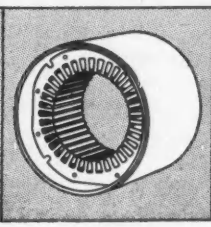
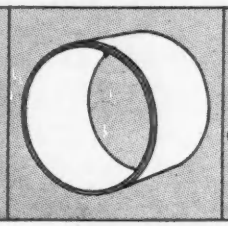
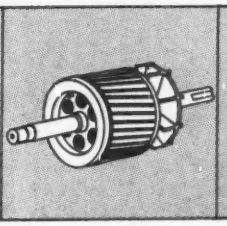
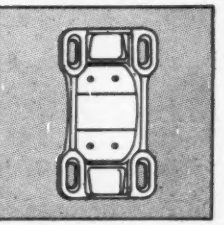
ALTERNATIVE TYPES TOTALLY ENCLOSED WITHOUT FEET FLANGE OR RESILIENT



BROOK GRYPHON
FRACTIONAL HORSE POWER MOTORS

## ATTRACTIVE FINISH

## BALL OR SLEEVE BEARINGS AT THE SAME PRICE

| BEARINGS | STAMPINGS | STEEL SHELL | ROTOR | FEET |
|---|---|---|---|---|
|  |  |  |  |  |
| Super silent ball bearings fitted as standard. | Pressure assembled pack ensures a rigid stator winding. | 3/16" rolled steel shell makes a stout outer frame. | Pressure cast aluminium rotor, dynamically balanced to give vibration free running. | Accurately machined cast iron feet. Firmly fixed but easily detachable. |

BROOK MOTORS LIMITED
HUDDERSFIELD

55/5

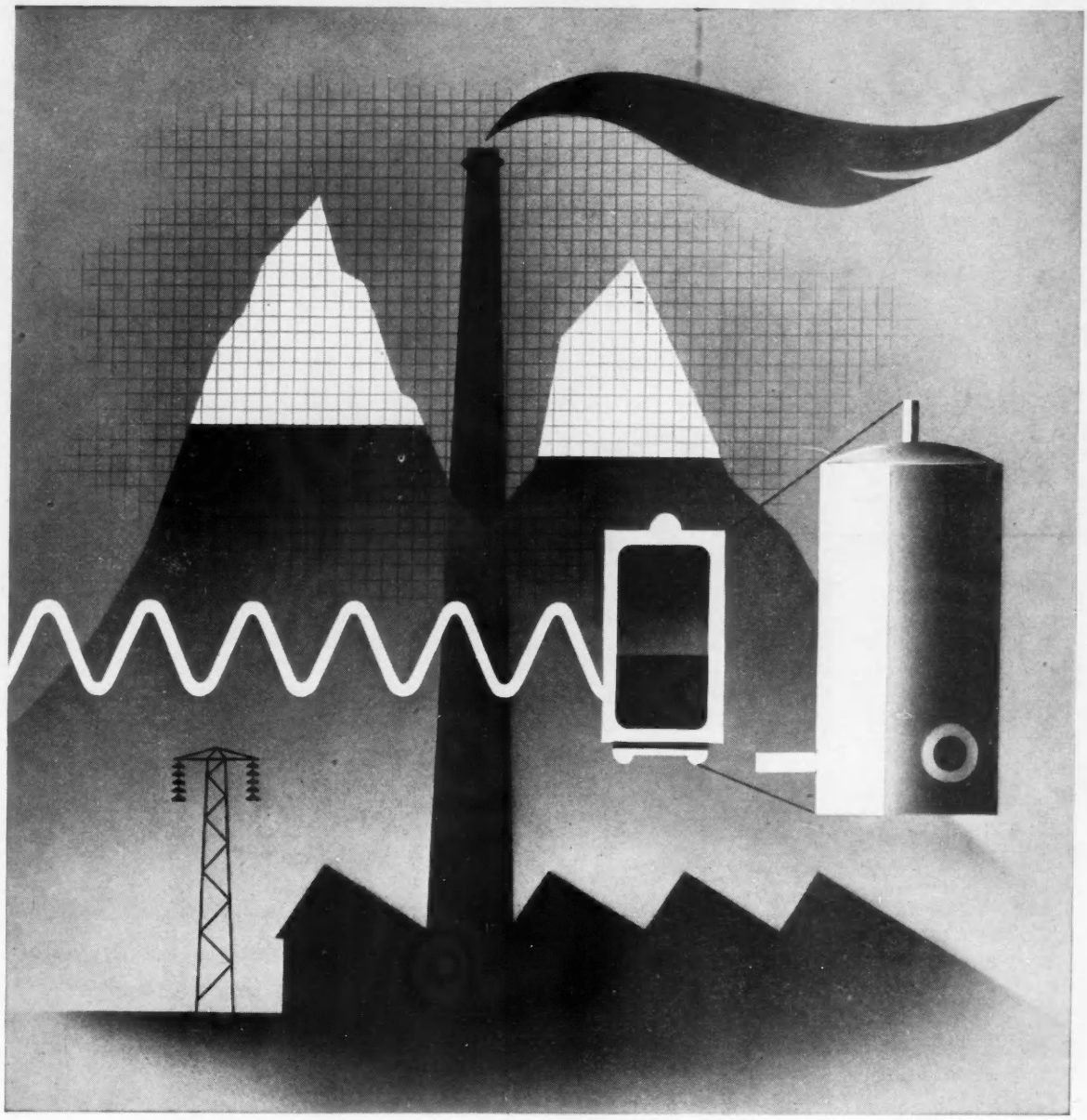
**Know your Goods!**

# These facts sell the G.E.C. HAIR DRYER

1. Modern design — competitive price — easy to sell.
2. Light in weight — perfectly balanced — easy to use.
3. Powerful airflow — adequate heat — easily operated switch.
4. Can be removed from the stand and used as a hand dryer.
5. All-insulated cream plastic body.
6. Operates on A.C. and D.C. electrical supply.

● *Retail price : £4.19.9 including Purchase Tax. Stand an optional extra, price 19/- including Purchase Tax.*

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2



# PEAK DIVIDENDS

Fully available electricity supplies enhance the value of " Rythmatic" ripple control as an investment for the electricity supply authority. With it certain loads may be transferred from peak periods to lightly loaded periods without inconvenience to the consumer but with considerable financial advantage to the supply authority. The availability of control also enables new load to be accepted without increasing maximum demand charges and the equipment offers the additional advantage of enabling the engineer to utilise his existing plant to sell more units.

The same injection equipment can also earn additional revenue if spare signals are used for two-part tariff metering and for street lighting control.
"Rythmatic" ripple control has been successfully applied for all these purposes.

RYTHMATIC RIPPLE CONTROL EQUIPMENT

AUTOMATIC TELEPHONE & ELECTRIC CO. LTD.
LONDON AND LIVERPOOL

AT 3871-A

# 'CORRILUX'

—ideal lighting fitting for indoors—because of its excellent appearance; and for outdoors—because the Corrilux is completely weatherproof, will not corrode and is of great strength

**LOWEST PRICED 27/- 100w BULKHEAD FITTING**

**Exceptional strength** body made of corrosion-resisting aluminium alloy, frosted finish

**Excellent light distribution**

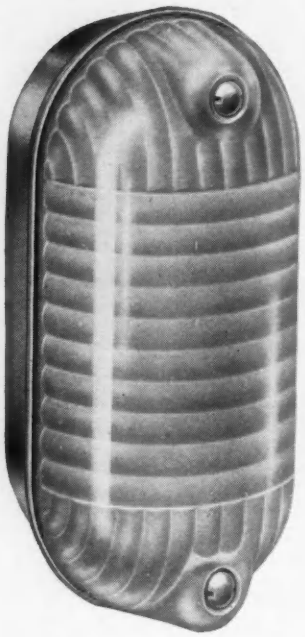
**Really attractive** appearance and finish

**Simple** installation—simple maintenance

**Completely weatherproof**

**Better glass mounting** 1-piece internally frosted glass of great strength, mounted on non-inter-cellular rubber gasket

**2" centre knockouts** and 2 brick-width knock-outs for fixing screws



**Five ¾" knockout** conduit positions

**Sealing compound** for conduit entry supplied with each fitting

**BC lampholder** (porcelain) with each Corrilux

**Alternative fixing** for lampholder position

**Holds any lamp** up to 100W

**Surface or semi-recessed**

**Through wiring** A suitable length of fibre-glass sleeving is supplied to protect cables

**2 secret key screws** retain glass. Easily fixed replacement glasses are supplied with captive screws

**For passages, corridors, doorways, staircases, toilets, under canopies, and all outbuildings on the farm**

MADE BY THE HOUSE OF Simplex

**Simplex Electric Co Ltd Blythe Bridge Stoke-on-Trent**
**London Showrooms: 217-19 Tottenham Court Rd London WC1**

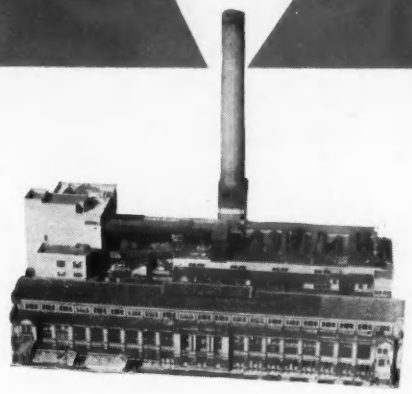
A TI COMPANY

**For the first time the British Electricity Authority thermal efficiencies exceed 30%**

# Highest Thermal Efficiency

# Portobello H.P.

# 30.86%



For the second year running, it was an ICL-equipped generating station which headed the British Electricity Authority Table, with a record thermal efficiency.

*Other ICL-equipped stations, high in the list are:—*

AGECROFT H.P. POOLE

LITTLEBROOK B SKELTON GRANGE

**Complete steam generation by**

**INTERNATIONAL COMBUSTION LIMITED**

**ICL**

LONDON OFFICE: NINETEEN WOBURN PLACE, W.C.1 WORKS: DERBY, ENGLAND; PORT ELIZABETH, SOUTH AFRICA; SYDNEY, AUSTRALIA.

SG 37

Angelus

ELECTRIC FIRES OF DISTINCTION

- *MODERN*
- *EFFICIENT*
- *ARTISTIC*

The New Safety Fire Guard complies with the latest British Standard requirements.

**SPERRYN & COMPANY LIMITED**

MOORSOM STREET, BIRMINGHAM, 6

*LONDON OFFICE: 23 Great Suffolk Street, S.E.1*

**ODDIE FASTENERS**

PAT. No. 507249

**The FASTENER with ENDLESS APPLICATIONS**
**SIMPLE — POSITIVE — SELF LOCKING**

Made in a variety of types and sizes

**SPECIAL FASTENERS TO SUIT CUSTOMERS' REQUIREMENTS**

Widely used in the Electrical Industry

**DEPT.: E.T.**

**ODDIE, BRADBURY & CULL LTD.**

**SOUTHAMPTON**

**Tel.: 55883** **Cables: Fasteners, Southampton**

THE

**NEW "MIDCOIL"**

**VARIABLE OUTPUT TRANSFORMER**

with superfine voltage control and

**OUTPUTS UP TO 20 kVA**

Example: 0-280 volts, variable from zero to full voltage in finely graded steps giving control throughout the range to within 0·12 volt at full load, with extremely

**GOOD REGULATION**

Of particular interest to **Designers** of test equipment and with many other **industrial** uses such as electrical furnaces, etc.

**FULL DETAILS AND PRICES ON REQUEST**

Other types include: **Low Voltage** Auto Transformers, **3 Phase** and **Phase Conversion** types, designed and produced to customers' specifications.

**A.I.D.** approved

*A Quality Product from*

**The Midland Coil Winding Co. Ltd.**

**4 LANCASTER STREET, BIRMINGHAM 4**

**PHONE: ASTON CROSS 1011** **GRAMS: "MIDCOIL, B'HAM"**

## Advice?

Is there a soldering process in your works that you feel could be improved? Then write to FRY'S. Our laboratory staff and research units will be pleased to help—entirely without obligation

Whatever the soldering process, there is a FRY'S product designed for the job! Tinman's solders, for cable joints, melt quickly, cleanly, and flow round the joint to give complete adhesion. For wiping lead sheaths, ABBEY and BELFRY plumber's solders ensure a smooth finish—free from blisters or pinholes. And for electrical soldering, where corrosive after-effects must be eliminated, there is the Alcho-Re range of soldering fluxes by FRY'S. Please write for samples and literature to:

**FRY'S** Metal Foundries Limited

**Tandem Works, Merton Abbey, London, S.W.19. Tel: MITcham 4023**

*And at MANCHESTER · GLASGOW · BRISTOL · BIRMINGHAM · DUBLIN*

45

SWIRLUX

**MODEL TS**

A seven point winner - smart appearance (with attractive stove enamel finish) - full size adjustable power wringer - power pump drainer - castors for easy movement - special Swirlux agitator - large capacity tub

**MODEL 500H**

The perfect small washing machine - heats the water - 6 lb capacity - 12 inch fold-down hand wringer - special Swirlux agitator (non-heated version Type 500 also available)

MODEL TS

500H

ROUND BOILER

SQUARE BOILER

VERSCO

**ROUND BOILER**

Obtainable in Galvanised finish as shown (a most durable finish of special appeal for Corporation and other housing schemes) or in cream stove enamel.

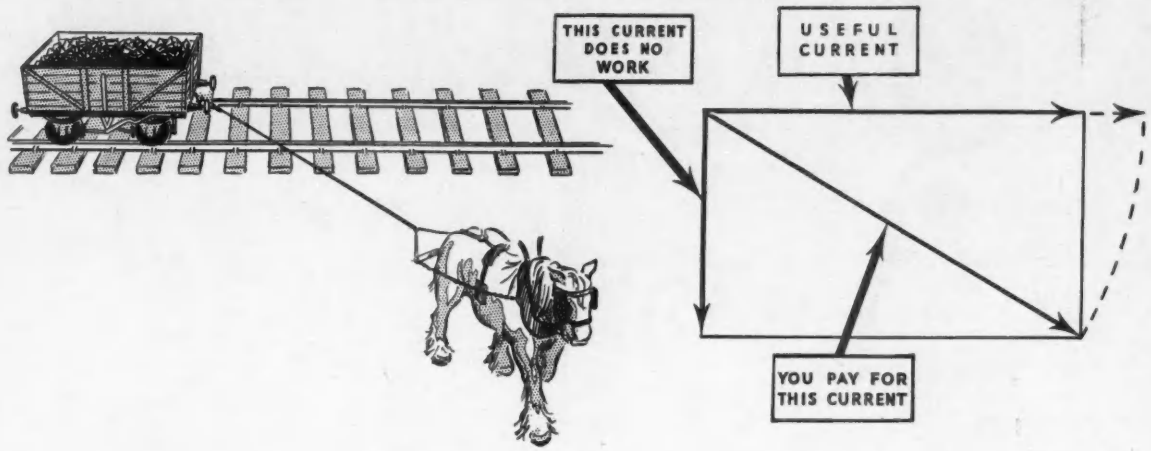
**SQUARE BOILER**

This smart and compact boiler is fitted with castors for easy movement and is finished in cream stove enamel. The table-top in cream vitreous is an attractive feature.

**UNIVERSAL BOILERS & ENGINEERING CO. LTD.,**

**FULLEDGE WORKS - BURNLEY - LANCS. *Telephone 3121 and 3203***

*ube 3473*




# *Wattless current does no useful work!*

Much industrial electrical plant still operates at an unduly low "power-factor", and users are penalised for this undesirable condition in their electricity charges.

The "power-factor" of an industrial works load can be improved to any desirable value by installing Ferranti Power Factor Correction Capacitors, and the capital cost can be recovered in savings in the cost of electrical energy, usually within one year.

Industrialists and other users concerned by rising electricity costs can profitably investigate this method of increasing the "earning capacity" of the electric energy consumed—Ferranti engineers will give advice and prepare schemes showing the substantial savings which are possible.

# FERRANTI

*Power Factor Correction*

**CAPACITORS**

**FERRANTI LTD · HOLLINWOOD · LANCS.** *London Office:* **KERN HOUSE, KINGSWAY, W.C.2**

FT.112

C

# MINERVA

## ELECTRICAL INSULATING VARNISHES

STOVING VARNISHES (NATURAL RESIN TYPE)

STOVING VARNISHES (SYNTHETIC RESIN TYPE)

THERMO-SETTING VARNISHES

AIR-DRYING VARNISHES

CLOTH VARNISHES

CORE-PLATE VARNISHES (STOVING AND AIR-DRYING)

COPPER-WIRE ENAMELS (OLEO-RESINOUS AND SYNTHETIC TYPES)

*All the above are supplied in black and clear.*

ACID AND HEAT RESISTING ENAMELS (AVAILABLE IN ALL COLOURS)

MICA BONDING VARNISHES

COIL STICKING VARNISHES

SLEEVING VARNISHES (BLACK, CLEAR AND COLOURS)

CABLE LACQUERS (NON-FLAM., CELLULOSE TYPE AND P.V.C.)

COMPOUNDS (VARIOUS TYPES)

*All the materials listed conform to B.S. Specifications wherever applicable.*

*Our Insulating Varnish Department includes research and testing laboratories; the service of specialists is available to any manufacturer or engineer concerned with problems of insulating materials and their application.*

**PINCHIN JOHNSON & CO.**

4 CARLTON GARDENS, LONDON, S.W.1. Tel.: TRA 5600

## CAPSTAN, AUTOMATIC PRODUCTION and PRESSWORK

A.I.D. A.R.B. C.I.A. I.N.O. APPROVED

**ROSS, COURTNEY & CO LTD**

*Ashbrook Road, London N.19*

*Telephone ARChway 1166|7*

*Telegrams HOMONYMS, Holway, London*

25987

# power factor correction

## CAPACITORS

Standard

There will be a capacitor to suit your working voltage and load from the various types of Power Factor Correction Capacitors designed and manufactured by S.T.C. Alternatively, capacitors can be designed to meet your particular problems. In either case our engineers will be glad to examine your load conditions and submit their recommendations.

**Standard Telephones and Cables Limited**

Registered Office: Connaught House, Aldwych, London, W.C.2

**POWER LINE DIVISION, North Woolwich, London, E.16, England. Albert Dock 1401**

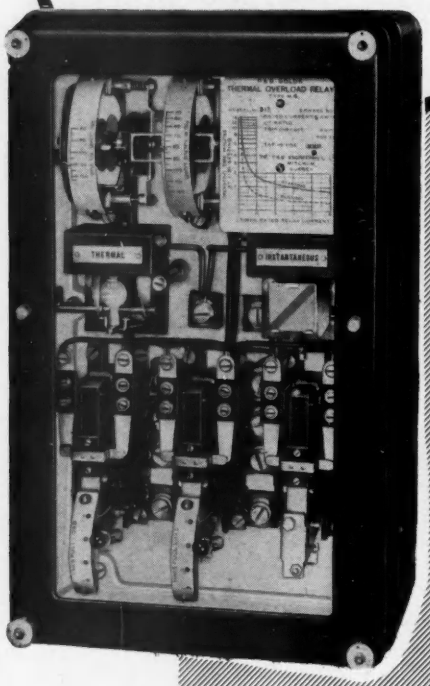
## THE SWISS ARE EXPERTS AT WATCH MAKING

Who can doubt it? Even so, the finest timepiece may occasionally be in need of repair. Similarly, faults can develop in the best conceived system of electrical wiring. And much inconvenience it causes when cabling is housed in barrel conduit of the ordinary type. CHANNEL CONDUIT, on the other hand, makes the overhaul of faulty circuits a routine task—for the patented capping *springs* off without difficulty, allowing quick access to the wiring layout. Rust-resisting and vibration-proof, CHANNEL CONDUIT costs less to buy, install and maintain than any other form of trunking. It is extensively used by Industry and Government Departments. Sizes stocked range from 4″ × 4″ to 1″ × ½″, and full details may be had by requesting a copy of pamphlet No. R.A.23.

**THE CHOICE OF THE EXPERTS**

**CHANNEL CONDUITS LTD.,**
11, Victoria Street, London, S.W.1.
*Telephone: ABBey 2027/8*

**PROTECT YOUR MOTORS with P & B Golds' Relays**



**For motors with any starting periods or starting currents under extremes of ambient temperature.**

*Send for descriptive pamphlet*

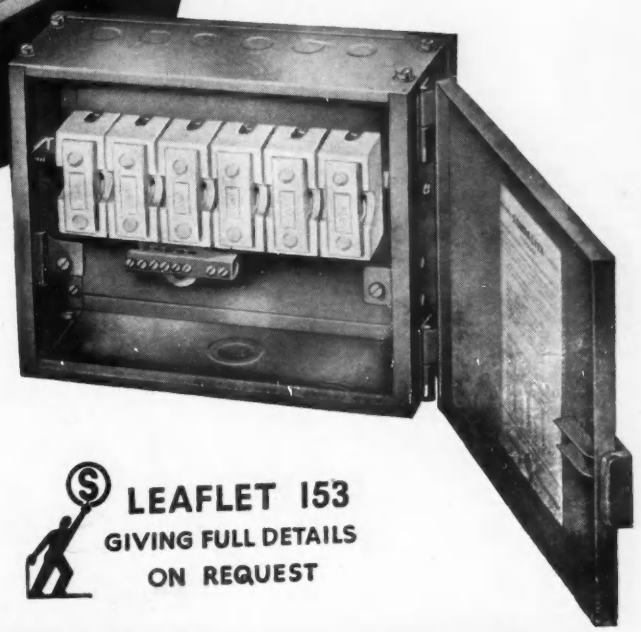
**THE P & B ENGINEERING CO · LTD**
CROMPTON WAY · CRAWLEY · SUSSEX
TELEPHONE: CRAWLEY 1004

now

# "SANDALITA"

## 250 VOLT SP & N FUSEBOARDS

. . . very inexpensively incorporating one of our long established and well tried fuses in a modern, light, sheet steel case.



*A further item in the development programme of*

**SANDERS**
WEDNESBURY

**LEAFLET 153**
GIVING FULL DETAILS ON REQUEST

WM. SANDERS & CO. (WEDNESBURY) LTD., WEDNESBURY, STAFFS.

# A *NEW* Surface Switch Socket Outlet

## AT A VERY COMPETITIVE PRICE

SWITCH SOCKET outlets incorporating the high quality Ediswan Avon A.C. switch are now available in 5 Amp and 15 Amp ratings. The fully positive Avon switch action has been tested and approved by the National Physical Laboratory. The socket outlet is set horizontally so that the cord cannot get jammed between the plug and the floor even when the accessory is fitted on narrow skirtings. Four knock-outs are provided for surface wiring.

Moulded mounting plates are also available. When inserted between the switch socket and the wall they completely enclose the back of the switch socket. Knock-outs are provided for various sizes of cable. Only two screws are needed to fix both switch socket and mounting plate.

| Switch Socket Outlets (complete with plugs) | | |
|---|---|---|
| *Cat. No.* | | *List Price* |
| 4910 | 5 x 3 pin surface S.P. shuttered. Brown. | 8/- each |
| 4911 | 5 x 3 pin surface S.P. shuttered. White. | 9/- each |
| 4920 | 15 x 3 pin surface S.P. shuttered. Brown. | 11/4 each |
| 4921 | 15 x 3 pin surface S.P. shuttered. White. | 12/8 each |
| | *Moulded Mounting Plates* | |
| 4508 | For surface 5 x 3 pin socket outlet. Brown. | 6/4 dozen |
| 4509 | For surface 5 x 3 pin socket outlet. White. | 8/4 dozen |
| 4515 | For surface 15 x 3 pin socket outlet. Brown. | 6/4 dozen |
| 4516 | For surface 15 x 3 pin socket outlet. White. | 8/4 dozen |

# EDISWAN

**ELECTRIC WIRING ACCESSORIES**

E 34

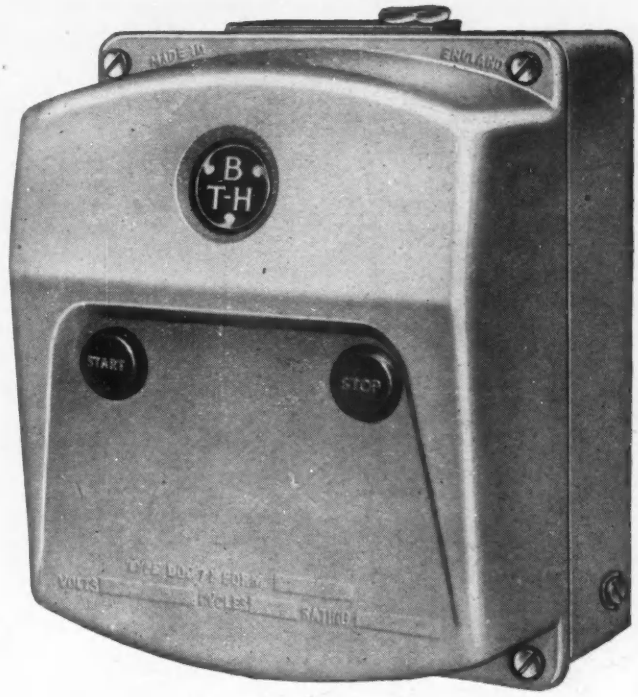
THE EDISON SWAN ELECTRIC COMPANY LIMITED

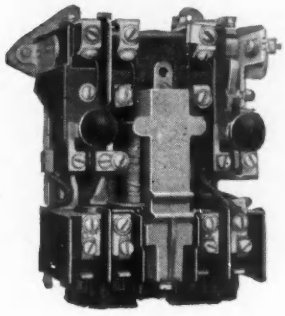
155 Charing Cross Road, London, W.C.2. Telephone: Gerrard 8660 *Member of the A.E.I. Group of Companies*

# A. C. Direct-on-line CONTACTOR STARTER Type DOC71

**for single-phase or polyphase non-reversing squirrel-cage induction motors.**

This new starter is elegant in appearance, sturdy in construction, and dependable in operation. It is available for motors up to 5 horsepower, and complies with BS.587 for "Frequent Duty", i.e. forty starts per hour.



The starter, comprising a triple-pole contactor with normally-open auxiliary switch and triple-pole hand-reset thermal overload relay, is enclosed in a distinctive die-cast aluminium case with integral START-STOP push buttons.

**Up to 5 h.p. 200-550 volts**
**25-60 cycles**

*DELIVERY FROM STOCK*

*Member of the A.E.I group of companies*

A4686

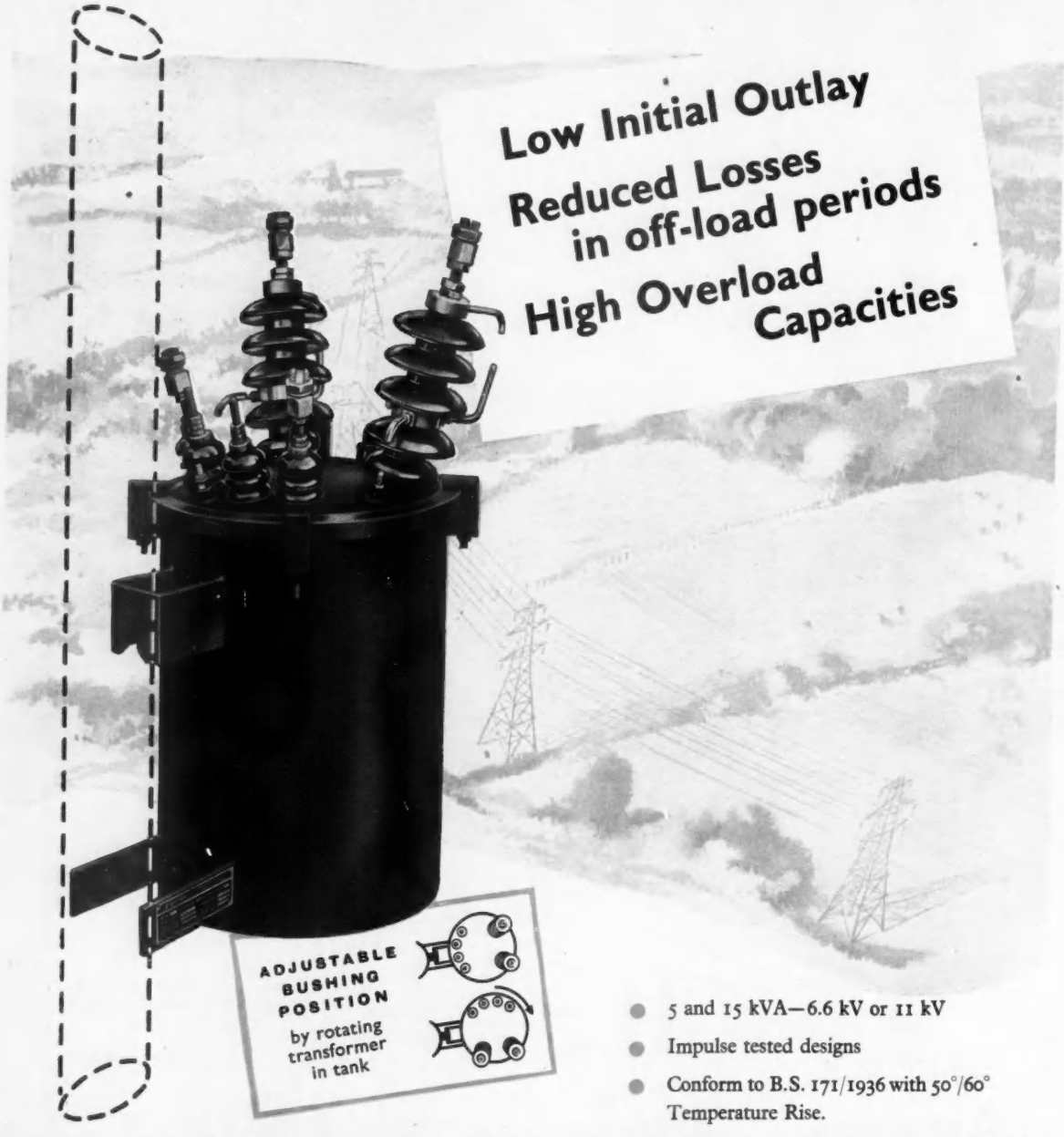
THE
**BRITISH THOMSON-HOUSTON**
COMPANY LIMITED, RUGBY, ENGLAND

# FOSTER

POLE-MOUNTED

# FRUGAL TRANSFORMERS

## *Cut the Cost* of Rural Distribution



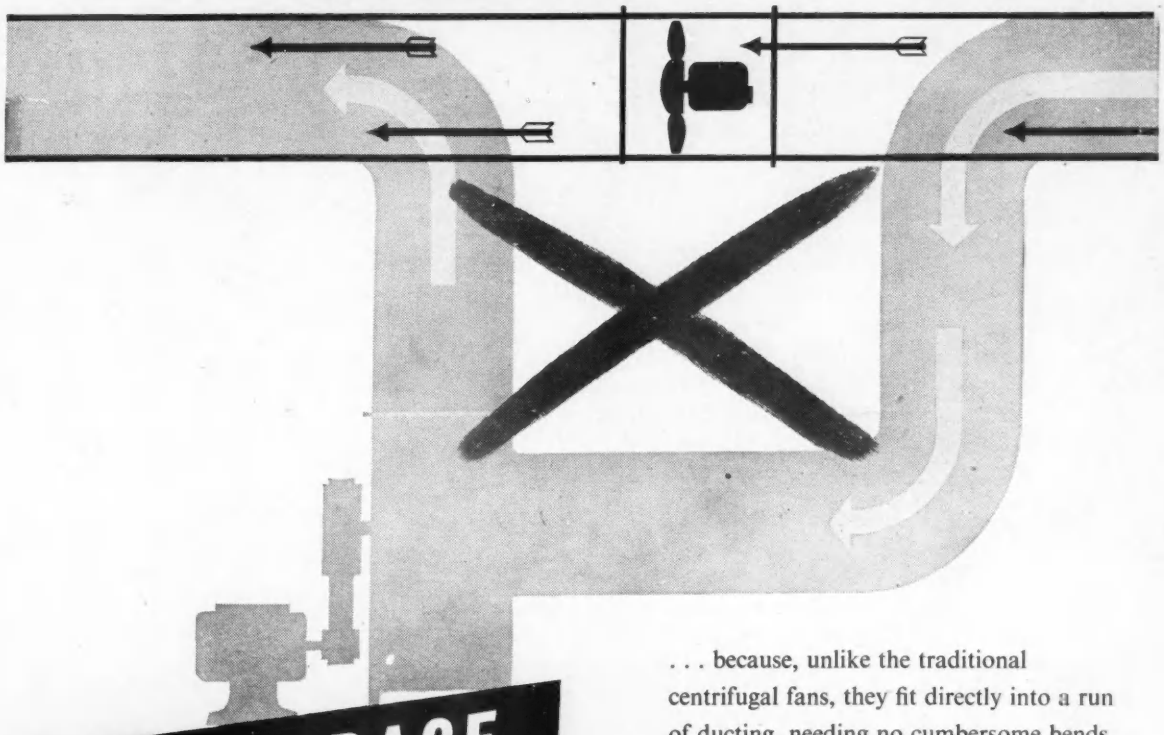

- 5 and 15 kVA—6.6 kV or 11 kV
- Impulse tested designs
- Conform to B.S. 171/1936 with 50°/60° Temperature Rise.

**FOSTER TRANSFORMERS LTD · SOUTH WIMBLEDON · LONDON S.W.19**

A 'LANCASHIRE DYNAMO HOLDINGS' COMPANY

TR/7

# AEROFOIL FANS



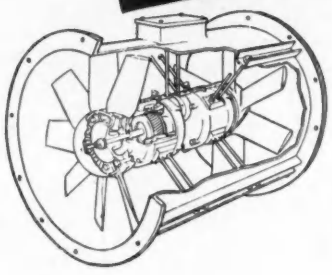
## SAVE SPACE

. . . because, unlike the traditional centrifugal fans, they fit directly into a run of ducting, needing no cumbersome bends, *taking up no floor space at all.*

## SAVE MONEY

. . . because ease of installation saves initial cost, because they are generally more efficient, consuming less watts for any given duty.

Pressures up to 20″ s.w.g. can be obtained by multi-staging standard contra-rotating units. Write for publication V.1089.



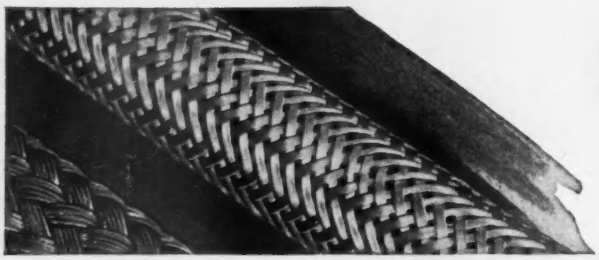
**WOODS AEROFOIL FANS**

WOODS OF COLCHESTER LIMITED, BRAISWICK WORKS, COLCHESTER

*An associate company of The General Electric Company Ltd.*

*Technical Representative at:*

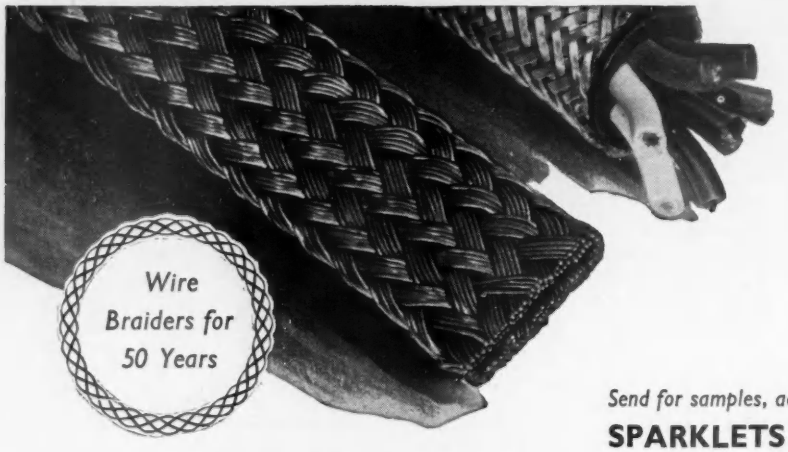
Birmingham: *Phone: Midland 4421 (Ext. 23 and 68)*
Cardiff: *Phone: 28055*
Glasgow: *Phone: Central 9250 (Ext 28b)*
Leeds: *Phone: 32171*
Leicester: *Phone: Granby 721*
Liverpool: *Phone: Royal 7282*
London: *Phone: Chancery 5474*
Manchester: *Phone: Blackfriars 3434*
Middlesbrough: *Phone: 3621*
Newcastle: *Phone: 25160*
Sheffield: *Phone: 25101*
Southampton: *Phone: 3511*



# SPARKLETS

## WIRE BRAIDING

*RUST-RESISTING · FLEXIBLE · DURABLE · ECONOMICAL*




1. For the protection of cable and flexible electric contacts.
2. For the screening and protection of flex in radio, television and radar.
3. For earthing in electrical apparatus and vehicles.

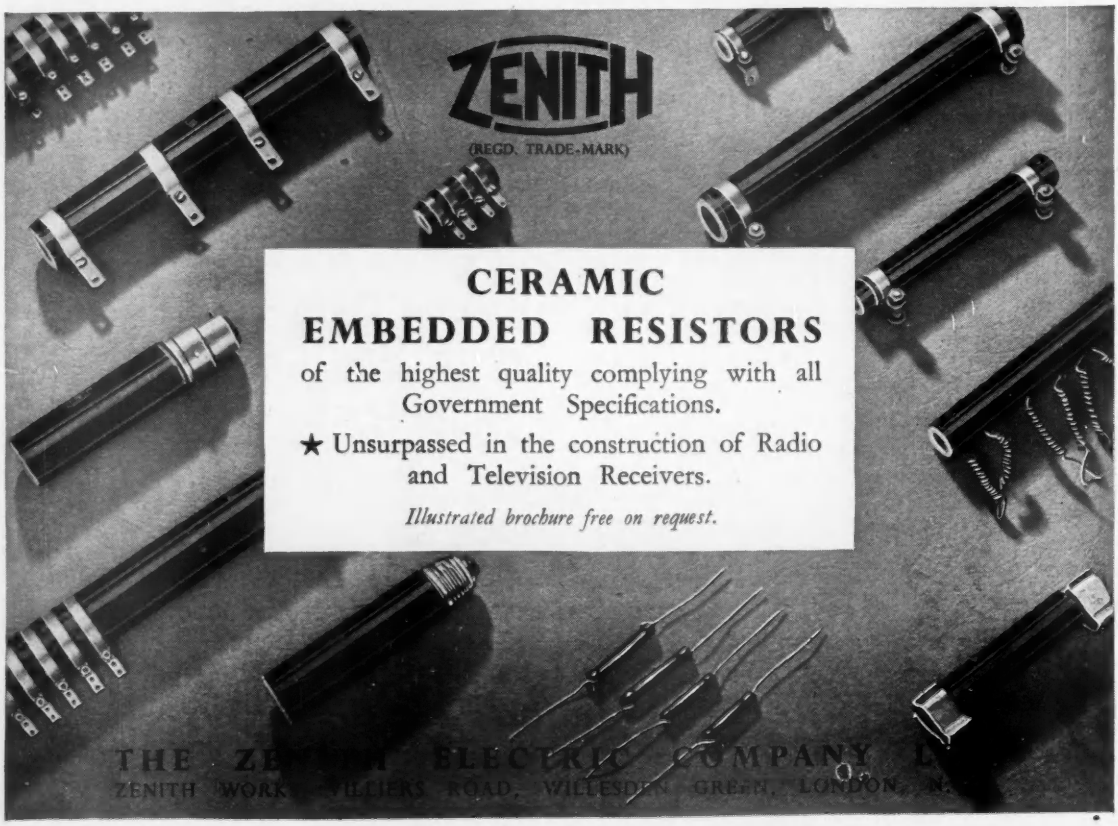
**Enquiries for Pressure Die-Castings also invited**

*Send for samples, advice and quotation to:*

**SPARKLETS LIMITED, Dept. W.T**

*Queen Street, Tottenham, N.17*

---


ZENITH
(REGD. TRADE-MARK)
CERAMIC
EMBEDDED RESISTORS
of the highest quality complying with all Government Specifications.
★ Unsurpassed in the construction of Radio and Television Receivers.
Illustrated brochure free on request.
THE ZENITH ELECTRIC COMPANY L
ZENITH WORKS, VILLIERS ROAD, WILLESDEN GREEN, LONDON, N.

*A load off your mind when you instal*

# METROVICK

## TYPE NF Watt-hour Meters

The demand for more accurate metering over today's extended load ranges has led to the development of the Type NF meter which offers the following important features :

- *High degree of accuracy over wide range of loads*
- *Complete temperature compensation*
- *Damping system giving complete stability*
- *Simple and accessible adjustments for calibration*
- *Easy dismantling for maintenance*
- *One terminal block for all capacities*

*Please write for leaflet 356/10-1*

METROPOLITAN-VICKERS
ELECTRICAL CO LTD · TRAFFORD PARK · MANCHESTER, 17

*Member of the A.E.I. group of companies*

*For Meticulous Metering*

G/A405

# Morlite

**LONG-LIFE**

**FLUORESCENT FITTINGS**

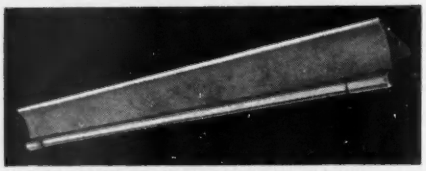
Our fluorescent fittings have been on the market for several years now. Because of their low initial cost, reliability and long life they are in ever increasing demand. Our clients evidently think these fittings pretty good and we are inclined (in all modesty) to agree with them. Just to prove the point, we guarantee all Morlite fittings for two years. Need we say more?

Our service department will be pleased to advise on any lighting problems.

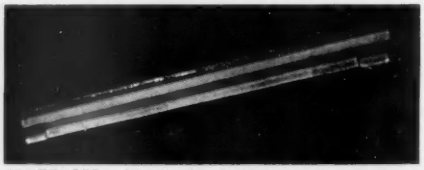
All fittings are finished in glossy, durable, white stove enamel.

Fluorescent tubes in several colours can be supplied for all fittings at makers' prices.

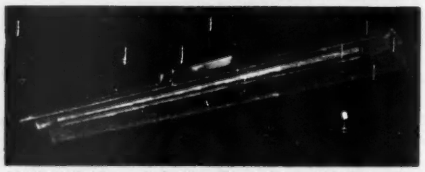
★ *An illustrated brochure giving complete details of our fittings is available on request.*



**MODEL MS5** is a 5 ft. 80 w. Single Seagull Reflector designed to give maximum all round lighting. It can be fitted flush to ceiling or suspended on chains or conduit. Supplied with all control gear (less tube) ... ... ... ... Nett **72/6**
A twin-tube fitting is also available. Model MS5X. Nett **111/6**



**MODEL SB5** is a 5 ft. 80 w. Standard Hexagon Batten designed to give maximum general lighting. It can be suspended or fitted flush to ceiling. Supplied complete with all control gear (less tube) ... ... ... ... ... Nett **59/6**
Model SB5X, a twin-tube fitting is also available. Nett **99/6**



**MODEL TM5** is a 5 ft. 80 w. Single Trough Reflector designed for use wherever concentrated light is required. Supplied ready for suspension and complete with all control gear (less tube) ... ... ... ... ... Nett **64/6**
A twin-tube fitting is also available. Model TM5X. Nett **104/6**

fluorescent MORLITE lighting

## MORLEY'S

**ELECTRICAL SERVICES**

**LIMITED**

117, HORNSEY ROAD, LONDON, N.17

*Telephone : NORth 5008 (3 lines)*

2703/Grove



# * Hot water by electricity?

# SADIA

# of course!

The Range of Electric Water Heaters, large and small, to meet every need. Each unit is built to a proud standard of perfection arrived at by more than 30 years of specialisation in electric water heating problems.

*Please write for fullest details to :—*

**AIDAS ELECTRIC LTD., SADIA WORKS, ROWDELL RD., NORTHOLT, GREENFORD, MIDDX.**

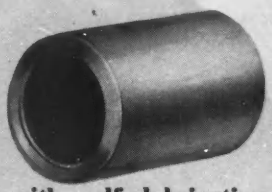
***Phone : WAXLOW 1607***

Agents for Scotland :— W. Brown & Co. (Engineers) Ltd., 89 Douglas Street, Glasgow, C. 2.

Manufactured in S. Africa by :— Sadia Water Heaters (Pty) Ltd., 3 - 5 Newton Street, Village Main, Johannesburg.

## *what have these parts in common?*

They are designed with a definite object

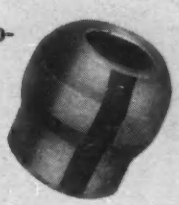


in view, to provide a finished part with self lubricating properties ready for

assembly. In most cases no further attention will be necessary during the life of the equipment.

Products made

by the Powder Metallurgy Process are made to precision tolerances, and by conventional standards price is low.



Only a few examples of

our comprehensive range are illustrated. Large stocks of Bearings and Washers are held against immediate requirements.

Send us your enquiries, we want to be of service to you . . .

Oilite

THE MANGANESE BRONZE & BRASS CO. LTD.

ELTON PARK WORKS, HADLEIGH RD., IPSWICH Phone: 55415-6 Grams: OILITE, IPSWICH

# Defenceless against this enemy!

*The firing of a homestead by hostile Indians in the pioneer days of the New World—a form of attack against which the settlers were virtually powerless.*

FOR centuries fire has been an invincible weapon in the hands of the wrongdoer, and the most disastrous of all accidental calamities. . . . But today fire is no longer the master. Fire can be beaten, at the outset, wherever there is a plan for swift action and the equipment to hand to implement it.

By installing 'Pyrene' fire fighting equipment you gain the assurance that if fire strikes, you have the means at hand with which to avert disaster. There is an extensive range of Pyrene Fire Appliances designed especially for the protection of electrical fire risks.

Why not write now for fully illustrated and descriptive literature to Dept. E.T.12:

**THE PYRENE COMPANY LTD**

9 Grosvenor Gardens, London, S.W.1

**YOUR DEFENCE AGAINST FIRE IS**

Pyrene TRADE MARK FIRE FIGHTING EQUIPMENT

**AN INVESTMENT IN PEACE OF MIND**

**HEAD OFFICE & WORKS** Brentford, Middlesex.
**CANADIAN PLANT** Toronto, Canada

---

COMPRESSION AND INJECTION MOULDINGS

SAWN AND MACHINED PARTS

**PLASTICS FOR INDUSTRY?**

RMP

*have the experience AND the equipment*

PERSPEX AND P.V.C. MOULDINGS

'RESOID' CLOSURES

LAMINATED TUBES, ANGLES AND CHANNELS

**RESINOID & MICA PRODUCTS LTD**
MARY ST · BIRMINGHAM 12 · Tel. Calthorpe 1303
LONDON · 28 Queen Anne's Gate, S.W.1.
Tel. WHitehall 8892
One of the group of companies associated with the Southern Areas Electric Corporation Limited

---

# Beginning at the end

**this is a Critchley thimble-type ferrule**

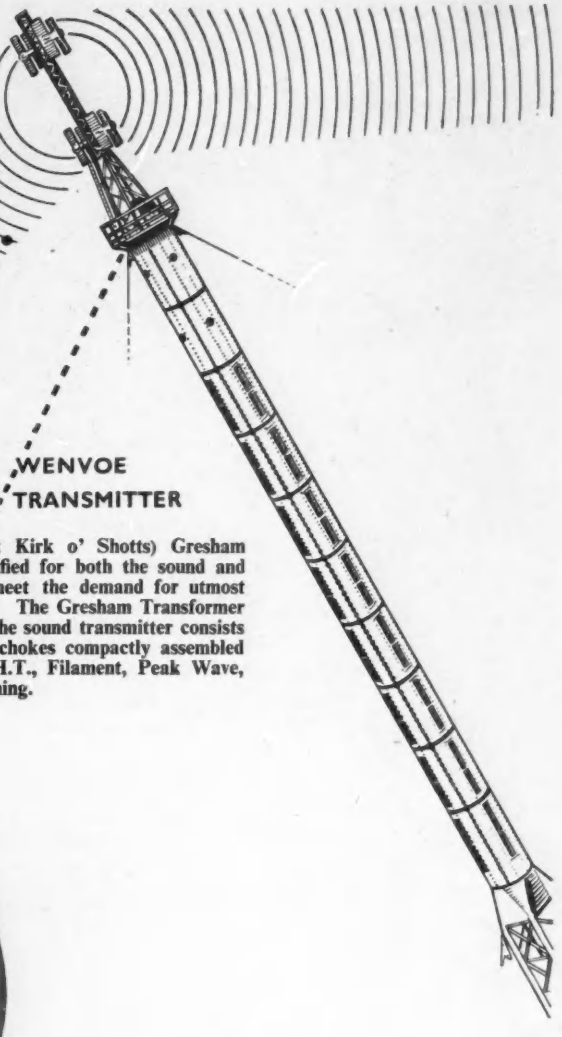
—the most economical kind when using large quantities of similar marking.

*Made for all sizes of cable.*
*Brilliant permanent colours include red, white, blue, black, yellow and green.*

**Leaflet and samples on request**

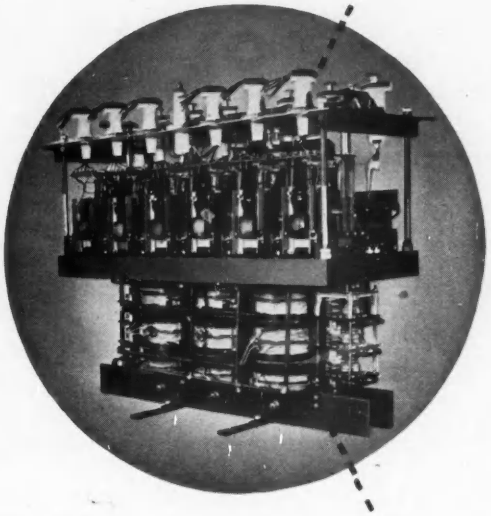
**CRITCHLEY BROS. LTD.**
**BRIMSCOMBE, STROUD, GLOS.**
Telephone : Brimscombe 2208

# TRANSFORMER PROBLEMS WE HAVE SOLVED..



**B. B. C. WENVOE**
**TELEVISION TRANSMITTER**

**At Wenvoe (as also at Kirk o' Shotts) Gresham Transformers were specified for both the sound and vision transmitters to meet the demand for utmost reliability and efficiency. The Gresham Transformer unit supplying power to the sound transmitter consists of 25 transformers and chokes compactly assembled in one tank to give E.H.T., Filament, Peak Wave, Grid Control and Smoothing.**

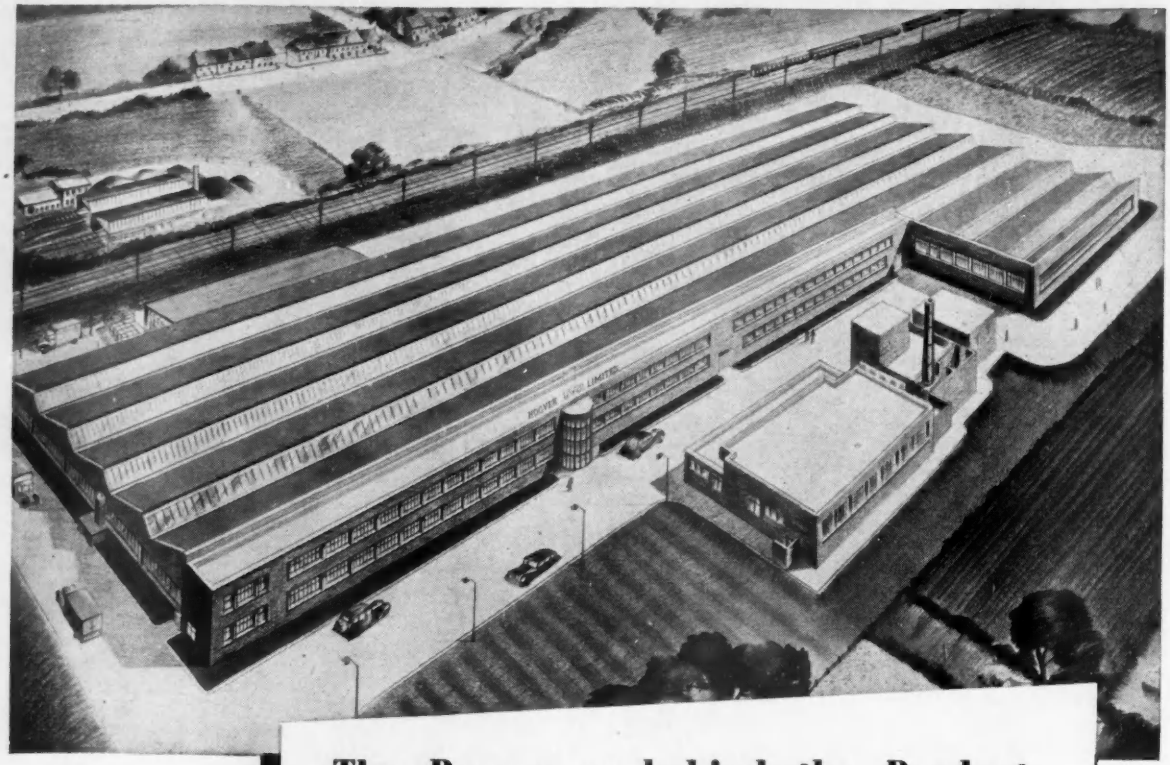


**Gresham Transformers Ltd. are Specialist Designers and Manufacturers who have progressively established and sustained a reputation for producing the most reliable transformers in Britain. Ranging in size from miniature electronic types to power distribution transformers up to 1500 kVA, 33000V their products are in constant demand in the fields of Radio, Electronics, Industry and Power Supply.**

*To Every Transformer Problem There is a* GRESHAM *Answer*

HANWORTH **GRESHAM TRANSFORMERS LTD** MIDDLESEX

TWICKENHAM ROAD, HANWORTH, MIDDLESEX. FELtham 2271-4



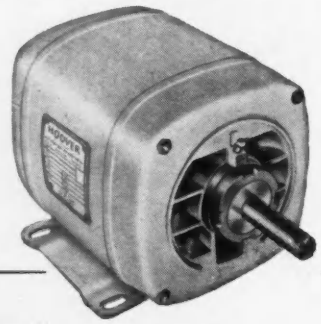
# The Resources behind the Product

*Hoover Limited at Cambuslang, Scotland*

THROUGHOUT the industrial world, Hoover Limited have won recognition for manufacturing F.H.P. motors of exceptional quality and dependability. This reputation has been gained by bringing together all their wide technical experience and endless engineering resources with one aim in sight — the finest possible F.H.P. motors.

Hoover motors combine complete reliability with a competitive price and are backed by a world famous service plan.

Of course, Hoover Limited also manufacture Stator/Rotor Units which have, today, applications in many modern industries as well as for Sealed Unit Refrigeration.



*For the name and address of your nearest distributor write to:*

## Hoover Limited

**INDUSTRIAL PRODUCTS DEPARTMENT**

CAMBUSLANG · LANARKSHIRE · SCOTLAND

# ELECTRICAL TIMES

ESTABLISHED 1891

THURSDAY, 9 DECEMBER, 1954
Volume No. 126 Number 3292
REGISTERED AS A NEWSPAPER

SARDINIA HOUSE, SARDINIA STREET, LONDON, W.C.2.
Telephone: HOLborn 6016
Telegrams: Equivolt, Estrand

*Editor and Managing Director:*
ROY BALDWIN, M.I.E.E., Barrister-at-Law

*Assistant Editors:*
J. K. JOHNSON, B.SC.(ENG.), A.M.I.E.E.
K. C. POUNDS, B.SC.(ENG.), A.C.G.I., A.M.I.E.E.


## In This Issue


Colour, Part I, *by H. Cotton*, M.B.E., D.SC., M.I.E.E. ... 843
The Case Against Outdoor Meters ... 846
Experience with Railway Electrification ... 847
Wood as a Dielectric ... 848
Readers' Views ... 848
Self-Regulating Alternators, Part II, *by J. Griffin*, A.M.I.E.E. ... 849
Manufacturing Circuit-Breakers in America ... 852
Ontario Hydro Forges Ahead ... 853
Mobile Radio for Line Maintenance ... 854
Around the Trade, *by Peregrin* ... 855
Overseas News ... 856
Personalities in the Industry ... 858
New Literature ... 861
Equipment for Industry ... 862
For the Electrical Trade ... 863
Problems and Practice in Engineering ... 865
News of the Week ... 866
Electric Supply News ... 871
Company Activities ... 872
Commercial Information ... 873
Classified Advertisements ... 53
Index to Advertisers ... 60



SUBSCRIPTION RATES

United Kingdom and Overseas £2. 10s. 0d. per annum. Canada $7.50. U.S.A. $7.50 per annum. Subscriptions are payable in advance and may commence with any issue throughout the year. Overseas subscriptions may be paid to The Electrical Times Limited by banker's draft, cheque or international money order. Single copies price 9d. each.


D

## OUTDOOR METERS RULED OUT

In America it is common practice to install watthour meters outside the premises concerned. This is said to be justified by the ease of meter reading but we recall that the earliest advocates of this practice had the prevention of fraudulent interference much in mind. Whatever may be the reason, however, the United States Productivity Team in their report following a visit to this country, recommended this practice on the grounds of saving in cost. Now it has been left to the North Western Board acting on a request from the Consultative Council to examine this claim. In the absence of any suitable weatherproof meter, consideration was given to installation in a steel cabinet accessible from the exterior. It is estimated that the annual charges, in view of the extra capital cost, would be somewhat greater than the present cost of meter reading, so that no saving could result. Furthermore, in a country addicted to prepayment metering, outdoor installation presents the most serious of handicaps, not to speak of a variety of other valid reasons against the practice. This suggestion is one more example of the difficulties of grafting on to the tradition of an industry, practice built up in a similar industry but in a different country.

## CO-OPERATION AGAINST CORROSION

Cathodic protection of buried structures is in no way new. This technique of stopping corrosion by ensuring that metal in the ground is electro-negative to the ground water in contact with it, is usually traced to a classic paper on ships' hulls read by Sir Humphrey Davy 130 years ago. Within the last 30 years or so, however, there has been a widespread increase in the application of cathodic protection, notably in connection with the long pipe-lines that are so essential a part of the rapidly expanding oil industry. Successful installations in this field have encouraged trials of this method of protection in many other applications. It is estimated that in this country alone there are more than 200 schemes in operation or projected. Unfortunately, there is another side to this picture. When one piece of metal in the ground is kept electro-negative and uncorroded there must be a path through the ground for the current that is flowing to that metal from a protective electrode. Other underground metals—cables, gas pipes, water mains—may offer the lowest resistance for such a path. If they do, then they become electro-positive to the surrounding soil, and any corrosion is accelerated. This is a situation that no one will

desire, and the best way of avoiding it is to act before installations are completed. Thus there should be a widespread welcome for the joint committee representing interested authorities that has now been established to investigate ways of preventing such complementary corrosion acceleration. Practicable methods of achieving this end exist, and with ready co-operation they should extend the effectiveness of protective schemes.

## INSPECTION REMINDER

Two of the county officers of Westmorland, the Chief Constable and the Chief Fire Officer, wrote recently to a local paper advocating strongly the inspection of domestic electrical installations and appliances by competent electricians and engineers. Their enterprise in this respect contrasts sharply with the comparative lack of activity by the electrical industry itself in publicising the need for such regular attention, despite the strong feelings of many engineers on the point. It raises directly the question of whether the industry does enough in this way. Of course, by its general acceptance of the I.E.E. Regulations, the industry pays lip service to a recommended maximum period between inspections, but little emphasis is given to this important requirement. To some extent, the reticence of the industry on the subject springs from an unwillingness to burden electricity with an exaggerated accusation of danger. Surely that is a sentiment more fitted to the early days than to the present time of almost universal domestic supply. As installations grow older, there is an increasingly strong case for supply authorities and others whose statements will receive attention, to give public support to the principle of regular inspection as a worth-while precaution.

## RAIL ELECTRIFICATION PROBLEMS

Although the Manchester-Sheffield-Wath railway electrification scheme is the latest in this country to go into operation, the fundamental design of the system dates back as far as 1936. Since then much has been learned. From information given in last week's I.E.E. paper on the subject, extensions of railway electrification would naturally take advantage of modern developments in locomotive design, substation equipment, switchgear and cables, and suggestions were included of the form these should take. Even so, as emerged during the discussion on the paper, considerable satisfaction was felt with the results of the first few months' operation. Passenger traffic has substantially increased—a phenomenon invariably associated with the introduction of electrified working—and freight traffic is being handled with much greater efficiency and dispatch. Some problems nevertheless still await solution. Tyre wear on the Bo-Bo locomotives has been remarkably high resulting in the necessity for tyre turning after only some 35,000 to 40,000 miles of running; regenerative braking down to a limit of 16 m.p.h. is not the optimum for the type of traffic worked, and wheel slip, particularly with banked trains, provides an operational difficulty. Modifications to equipment together with experimental work to solve these and other drawbacks are of course in hand, but it seems somewhat remarkable that with the wealth of experience available to British manufacturers and consultants (much of it gained on overseas systems with even worse operating conditions), solutions to these problems are still awaited by British Railways.

## MORE PEAT FOR POWER

Scotland has accessible reserves of peat totalling about 1,600 million tons of dry matter, of which 600m tons are workable, but at present this fuel source is tapped only on a small scale. The Scottish Peat Committee, which reported early this year, envisaged a great increase in its use, with power generation playing a leading part. Particular technical interest attached to their detailed report, for they supported strongly the development of the peat-burning gas turbine as the appropriate machine for utilising the energy in peat. Although they showed cognizance of the considerable experience abroad in using peat to fire power station boilers, they saw little economic prospect of the establishment of large steam stations burning this fuel. Yet such has been the subsequent course of events, that experimental work on peat-firing is likely to commence shortly in the south of Scotland in existing power stations. This was stated last week by Mr C. W. Marshall, who suggested that the price of coal now seems certain to rise to a level where burning peat for electricity generation will be economically attractive. This development is unlikely to affect the gas turbine as the main outlet for peat in power production; but it will be a welcome addition to the demand.

## PLUG FOR RING-CIRCUITS

Advertising by electricity boards must necessarily cover a wide range of subjects, with the accent understandably on selling those appliances which fit in with current policies of load building. Departures from such direct selling are refreshing, and a current series of newspaper advertisements being run by the South Eastern Electricity Board seems particularly commendable in this respect. Dealing with adequate wiring — the essence of the load-building — different advertisements aim to tell architect, builder and consumer alike the leading advantages of the ring-circuit. At this late date it might be thought that all connected with the building trade would be familiar with this detail of contemporary wiring practice, yet experience shows that although the name is recognised readily enough, and the impression exists that the technique offers the chance of economies, architects and builders have failed to appreciate the true opportunities that the ring-circuit offers, both in respect of initial adequacy and of relative ease of future expansion in number of socket-outlets. As for the potential house-owner, a softening up by information such as these advertisements present will make him more ready to understand and accept the cost of the ring-circuit when shown in the specification of the house he is to buy. There is, indeed, room for more emphasis usefully to be placed on adequate wiring in the plan of electricity supply publicity. Seeboard's advertisements are a step in the right direction.

Meteor

# COLOUR PART ONE

***First in a series of articles assessing the meaning of Colour and its measurement***

**By H. COTTON, M.B.E., D.Sc., M.I.E.E.**

*Emeritus Professor of Electrical Engineering in the University of Nottingham*

LIGHT is a sensation caused by the impact on the retina of radiation within the visible range. Colour can be defined in exactly the same terms since colour is an attribute of light. For example the radiation from a sodium lamp is, very nearly, a radiation of wavelength 5,893 Å. This wavelength is within the visible range of the normal person and therefore the radiation from the lamp causes the sensation of light. We can extend this statement by saying that the sensation produced is associated with that quality of light which we call yellow. Similarly the radiation of 5,461 Å emitted, along with others, by the mercury vapour lamp, is also within the visible range and therefore capable of producing the sensation of light, but the quality of the light is now green.

It follows therefore that to define colour we must extend the definition of light, and for this purpose we can use the definition in the Oxford Dictionary, which is as follows:—"Colour—the quality in virtue of which objects present different appearances to the eye, in respect of the kind of light reflected from their surfaces." In this definition it is clear that by the "kind" of light is meant the wavelength of the radiation, or, if there are radiations of several wavelengths, then the relative amounts of these various component radiations and their wavelengths. In the above form the definition refers to illuminated surfaces, but if we substitute "emitted by them" for "reflected from their surfaces" then the definition becomes general.

The light from a source or from an illuminated surface can be (a) *monochromatic*, consisting of one wavelength only or (b) *heterochromatic*, consisting of several, or many, wavelengths. In the case of monochromatic light the assessment of colour is a simple matter since the colour is defined uniquely by the wavelength of the radiation. Thus the 6,563 Å radiation of the hydrogen discharge is red; the 5,893 Å of sodium, yellow; the 5,461 Å of mercury, green; the 5,086 Å of cadmium, blue; the 4,358 Å of mercury, violet; and so on. Consequently if visible radiations were only monochromatic there would be no problem of colour assessment; the difficulty arises in that a heterochromatic radiation of one composition may evoke exactly the same visual sensation as another radiation of entirely different composition. In fact, a heterochromatic radiation may evoke the same sensation as a monochromatic radiation. On the other hand it is impossible, in the case of a person with normal vision, for monochromatic radiations of different wavelengths to evoke the same visual sensation.

Fig. 1 shows the spectral power distributions of two heterogenious radiations. The first is that of what is called Standard Illuminant C, which is a tungsten filament lamp operated at 2,854° K* and used in conjunction with a filter described later. It will be seen that this illuminant gives a continuous spectrum since, for every wavelength within the visible range there is an ordinate of finite magnitude. The second is a mixture of two monochromatic radiations, one 4,900 Å and the other 6,050 Å, the spectrum thus consisting of two very narrow lines of these two particular colours, and of nothing else. It is difficult to imagine two more completely differing spectral power distributions, and yet the two radiations will result in identical colour sensations. It is not, in general, possible for any colour to be matched in visual sensation by a mixture of only two monochromatic radiations, but this matching is possible when three monochromatic radiations such as red, green, and blue are mixed in the correct proportions. This phenomenon is the basis of the trichromatic system of colour measurement, described below.

**The International Temperature Scale used in assigning colour temperatures to light sources was revised in 1952. The basis of three colorimetric illuminants known as A, B and C respectively, is a tungsten filament lamp operated at a voltage which gives a definite distribution of radiant power throughout the visible spectrum. The colour temperature is generally given as 2,848° K, but the revised value is 2,854° K.*

## *Attributes of Colour Sensations*

The physical cause of the sensation of sight is the impact on the retina of radiant energy of wavelength, or wavelengths, within the visible range; the physical cause of the colour associated with the sensation is the range of wavelengths in the radiation and the relative powers of these wavelengths. Thus the colour is decided by the shape of the spectral power distribution of the radiation. On the other hand this spectral power distribution is not an attribute of colour, it is the cause of the colour sensation.

The attributes of a colour sensation are (i) the hue, (ii)

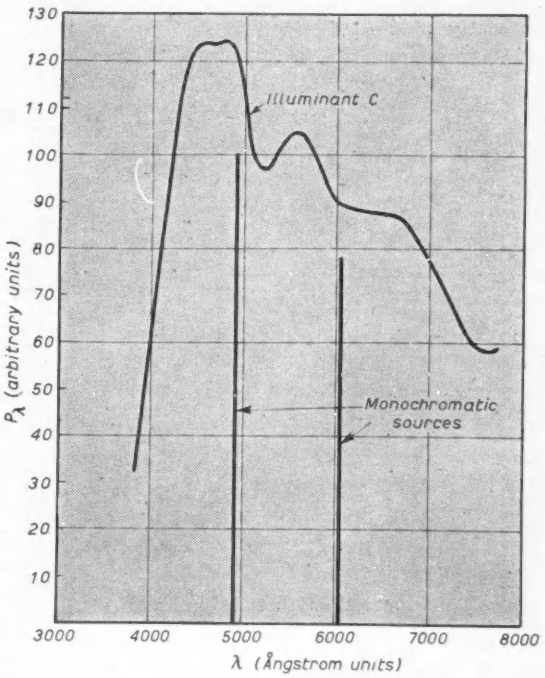



*Fig. 1. Two spectral distributions resulting in the same colour sensation*

the luminosity and (iii) the saturation. The term hue is often used loosely to mean the same thing as colour, whereas its actual meaning is the description of a particular colour. For example, if we say that the colour of an object is green, we use the term colour correctly if we do not specify the particular kind of green, but if we say a green is the green of the mercury discharge then this precise specification warrants the term hue. Thus the author of the sad little song about the peach of emerald hue was correct in his use of the word. The definition in the Oxford dictionary is:—"Hue:—variety of any colour; tint or quality of a particular colour." The definition given in the Glossary of Colour Terms, B.S. 1611:1952 is: "the attribute of visual perception denoted by blue, green, yellow, red, purple, etc."

Since colour is an attribute of light, being dependent on the spectral power distribution of the radiation causing the sensation of light, the luminosity of a coloured object has the same meaning as before, namely "the attribute of visual perception in accordance with which an area appears to emit more or less light." Fig. 2 shows the spectral power distribution within the visible range of a tungsten filament lamp operated at a colour temperature of 2,854° K. Curve A is identical in shape to curve B, the ordinates being multiplied by two. Thus in each case the relative spectral powers are the same and therefore the sensations produced by each will be of the same hue. The only effect of the increase in ordinates, provided that the magnification is the same for every wavelength, is an increase in luminosity. Because of the operation of the Weber-Fechner mechanism the objective change of doubling all the ordinates does not result in the subjective change of a doubled luminosity.

Saturation is defined (in B.S. 1611:1952) as: "the attribute of a visual sensation which permits a judgment to be made of the proportion of pure chromatic colour in the total sensation." In other words, saturation is the percentage of hue in a colour. Imagine a matt reflecting surface which has the property of reflecting any incident radiation with its identical spectral power distribution, then the colour of this surface, when illuminated by a source, will be identical with the colour appearance of the source. Let this surface be illuminated by means of a sodium vapour lamp, then the colour of the surface will be yellow, and the hue will be that characteristic of the sodium discharge. The colour will be what is called a full colour, such colours being defined (B.S. 1611) as surface colours which are produced with the maximum colourfulness obtainable, and the hue will be a saturated hue, consisting of the sodium yellow only with no admixture of any kind whatever.

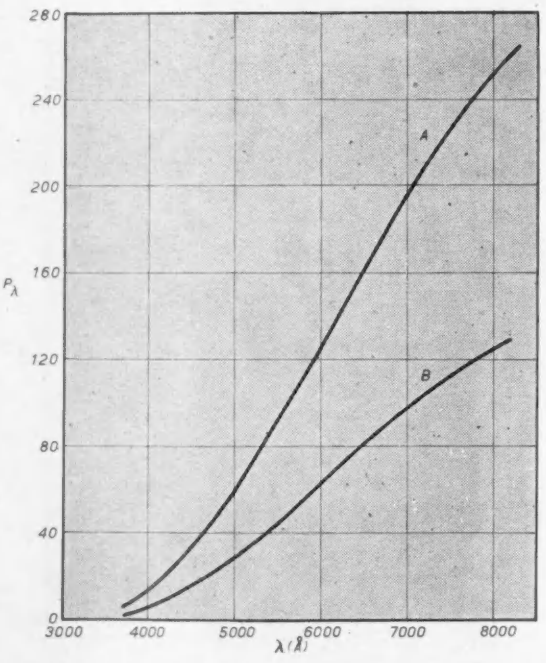



*Fig. 2. Spectral power distributions of tungsten filament lamps known as Standard Illuminant A and operated at a colour temperature of 2,854° K*

Now let the surface have additional illumination from a second source giving white light, then this admixture of white will cause the hue to become desaturated. The greater the proportion of white to yellow, the greater will be the degree of desaturation. Hence, if we imagine that, as the amount of white is increased while the amount of yellow is decreased until eventually there is only white, then, starting with the saturated hue, we pass through every degree of desaturation and come eventually to a white of no hue. At every stage in the process—apart from the final stage of pure white—the hue is the same, namely that of the saturated hue of wavelength 5,893 Å with which we started.

## *Subjective Definitions*

It is important to realise that what we have described above are sensations each due to a causal stimulus or a set of stimuli. Hence these sensations, of light, colour, hue, luminosity and saturation are defined subjectively since they are not susceptible of direct measurement. They are mental variables which can only be described by reference to the physical stimuli which produce them. Thus we can describe a colour by reference to some familiar physical object possessing that colour, for example the green of grass or the red of a geranium, but there is no simple relationship between the stimulus and the sensation produced.

The following extract from "The Measurement of Colour"[1] will make this clear. "When two sources radiating light of the same energy distribution are compared side by side, the one emitting the greater amount of energy per unit area will appear the brighter. The apparent brightness will admittedly be affected by the state of adaptation of the eye.... but for a given state of adaptation we can assume that the amount of physical energy and the magnitude of the visual sensation will increase or decrease together. On the other hand, the change in the appearance of a diffusely reflecting surface with change in illumination level is generally of small proportions. Non-luminous surfaces are judged almost entirely by comparison with surrounding surfaces, hence an object observed, say, in a hall illuminated by 100 lamps will alter little in appearance if 90 of the lamps are switched off, since the change in illumination affects all the objects in the room equally. It is true that we are conscious of the lower illumination in the room as a whole, but by some process of mental adjustment we allow for this in judging the appearance of a surface, so that a sheet of white paper still looks white and not grey, an orange surface continues to look orange and not brown, and so on. Moreover, after a few minutes in the hall, the light sensitivity of the retina adjusts itself to the reduced illumination and the hall may look almost as bright as before. For this case, therefore, there is little correlation between the amount of light and the visual sensation."

*Further definitions* given in B.S. 1611 include *chromatic sensations*: "visual sensations possessing the attribute of hue" and *achromatic sensations*: "visual sensations devoid of the attribute of hue." Achromatic sensations differ in luminosity only. There are three types:

*White* (*a*) An achromatic sensation of relatively high luminosity, (*b*) As defined in (*a*), but applied to a secondary

source which is non-absorbing at all visible wavelengths.

*Black* (*a*) A visual sensation arising from some portion of a luminous field of extremely low luminosity. (*b*) As defined in (*a*), but applied to a secondary source which is completely absorbing at all visible wavelengths.

*Grey* (*a*) An achromatic sensation of luminosity intermediate between black and white, (*b*) As defined in (*a*), but applied to a secondary source which is partially absorbing at some or all visible wavelengths but from which the reflected or transmitted light has the same colour as that of the incident light.

## *Three-colour Sensation Theory*

We know that the radiation from a source can be resolved by means of a suitable dispersing system into a spectrum. In the case of white light the spectrum covers the whole of the visible range; if there is a gap over which the energy is zero, or very small, in relation to the energy at other wavelengths, then the appearance of the light will not be white, but will be coloured, the particular colour depending on the position of the gap. Suppose that the spectrum from a source of white light is recombined then the result will again be white. If, before recombination a portion of the spectrum is masked out the result will be

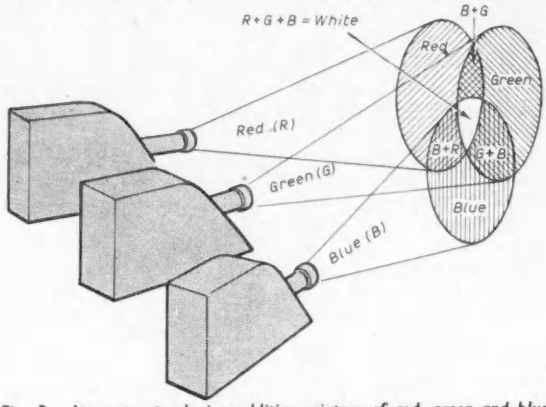



*Fig. 3. Apparatus producing additive mixture of red, green and blue to give the three secondary colours and white*

a colour dependent on the position of the gap. Now suppose that two wide gaps are made, leaving only three narrow bands at the red, green and blue, then on recombination the result will be either a white or a very desaturated colour, according to the widths of the three bands and their relative luminosities.

The simplest way to do this is to combine the light from three projectors having in place of the normal slides, red, green and blue filters respectively. Denoting the three colours as additive primary colours the result of their combination will depend on their relative magnitudes. Fig. 3 shows the experiment, the relative amounts being such that the combination of all three gives white.

When only two of the primary colours overlap the resulting colour is called a secondary colour. There are three of these, namely: Red + Green = Yellow; Green + Blue = Blue-green or Cyan; Blue + Red = Purple or Magenta. By altering the relative proportions, the result of the addition of the three primaries will no longer be white, and the three secondary colours will also change in hue. It is found that, within the limits described below, any colour can be matched by a suitable mixture of two or all three of the primary colours.

The proportions in which three primary colours must be mixed in order to give a visual match with any given sample colour depends, of course, on the spectral composition of

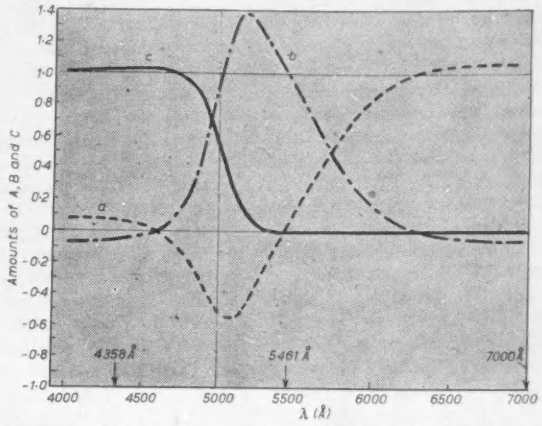



*Fig. 4. Colour mixture curves due to Guild to give a visual match with any sample colour*

the primaries chosen. Fig. 4 shows a set of curves obtained by Guild[2] who used monochromatic primaries of wavelengths 4,358 Å, 5,461 Å, and 7,000 Å respectively. The relative ordinates are such that a mixture of all three in the proportions which apply to any particular wavelength will give a colour mixture of hue appropriate to that wavelength. For $\lambda = 4{,}358$ Å, the ordinate for the response curve for this particular wavelength is unity and that for the other curves zero: similarly for $\lambda = 5{,}461$ Å and $\lambda = 7{,}000$ Å

The presence of negative ordinates is important and can be interpreted as follows. Let a colour of any particular wavelength be denoted by C and let the ordinates of the red, green, and blue curves be u, v and w respectively. Then v, u, and w are the amounts of the three particular primaries required to give a colour match with the colour C so that we can write $uR + vG + wB = C$. From the curves we see that at wavelengths for which all three curves have finite ordinates one of the three is negative. Take the wavelength 5,000 Å for example: the ordinates are

$$u = -0{\cdot}52;\ v = +0{\cdot}97;\ w = +0{\cdot}54$$

Hence $$-0{\cdot}52R + 0{\cdot}97G + 0{\cdot}54B = C_{5000}$$

or $$0{\cdot}97G + 0{\cdot}54B = C_{5000} + 0{\cdot}52R$$

The interpretation of this is that if 0·54 units of the 4,358 Å primary are mixed with 0·97 units of the 5,461 Å, a colour match will be made with 1 unit of monochromatic 5,000 Å radiation provided this is mixed with 0·52 units of the 7,000 Å. In the practical measurement of colour by the method of matching with a mixture of primary colours we shall see that this device of transferring a primary colour to the sample colour, or some equivalent device is commonly employed.

This process of colour matching by the mixture of suitable amounts of three primaries is the basis of the three-colour sensation theory of vision. Since a mixture of three suitable primary colours can produce the same visual effect as the sample colour, it was assumed by Young and later by Helmholtz that the normal visual apparatus consists of three separate mechanisms which are capable of independent stimulation. By analogy with colour mixture experiments, it was assumed that the three mechanisms are each sensitive to a specific part of the spectrum, namely, one to the red, one to green and one to blue. It was further assumed that each mechanism covered a band of the spectrum, there being response to a progressively diminishing degree on either side of the wavelength of maximum sensitivity. According to this theory, colour recognition is possible because any particular colour will

stimulate the three mechanisms to the appropriate extent, the sum total of the effects of the three stimulations being the sensation appropriate to the colour producing them.

We know that the retina houses two different types of receptor, namely the rods and the cones, and that the cones, concentrated mainly at the fovea are the receptors responsible for the sensation of colour. It might appear therefore that an obvious corollary to the Young-Helmholtz theory is that there should be three kinds of cone receptors, or possibly three types of nerve fibre. So far the histological examination of the eye has not revealed more than one kind of cone receptor or more than one kind of nerve fibre. The complete chain of events starting with the reception by the eye of visible radiation and ending with the sensations of colour and of luminosity is so complex and involves so many sciences, physical, physiological and psychological, that a full explanation in terms of colour matching data alone is quite impossible. On the other hand, colour mixture data are established experimental facts which are not disputed whatever theory of colour vision may be held. Hence, at the present time, all that we are justified in assuming is that there appear to be three independent mechanisms, stimulated maximally by red, green and blue respectively and each capable of independent stimulation. The sensation of colour is the result of impulses sent to the brain along the nerve fibres as a result of the relative intensities of the three stimulations.

*(To be continued)*

**REFERENCES**

1. W. D. Wright: "The Measurement of Colour," Adam Hilger Ltd.

2. J. Guild: Proc. Royal Society, Series A, Vol. 230, 1932, page 149.

# The Case Against Outdoor Meters

## *North Western Electricity Consultative Council Regards System as Uneconomic*

AT a recent meeting of the North Western Electricity Consultative Council, the secretary, Mr F. J. Marron, presented on behalf of a three-man team a final report on the investigations which the North Western Electricity Board's technical staff had been making into the study of outdoor meters. In order that the team should be able to examine the problem from a practical aspect, the staff constructed a dummy brick cavity wall and inserted two types of meter boxes.

In the discussion with the Chief Engineer and his assistants many points were raised of which probably the most important was that of the economic considerations. It had been worked out that the total cost of reading a credit meter four times a year on the ordinary low-voltage consumer's premises worked out at 2s. 5d. This sum included the wages of meter readers and special duty men, supervision, clerical work, transport, travelling, printing, stationery and equipment and uniform clothing. If, therefore, it were possible to eliminate completely all meter reading, the saving to the board would only be 2s. 5d. per annum per consumer. If, on the other hand, it cost the board 30s. more to provide, install and suitably protect an outdoor meter instead of an indoor unit, the annual charges would be 2s. 6d. and there would be no saving to the board. It would undoubtedly cost more than 30s. extra for an outdoor installation with greater maintenance.

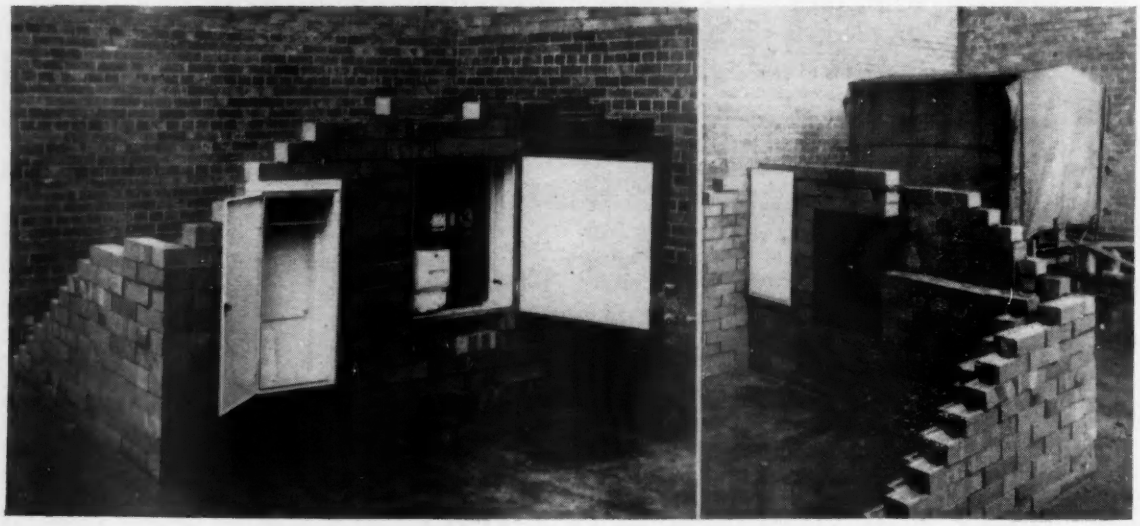
The use of prepayment meters would be precluded by the use of outdoor meters, and the board might thus find itself involved—together with the consumer—in considerable expense in the event of a change of tenancy.

Another problem was that main switch and fuse gear should not be accessible from outside and as in many installations it would not be practicable to have the outside meter and the switch and fuse gear adjacent, considerable cable lengths would be necessary.

Other points which were considered included the absence, as yet, of an approved outdoor British meter, the difficulties of installation with an underground cable system —as opposed to the overhead distribution systems largely used in America, difficulties of recording readings in rain or snow, and difficulties in preventing damage.

It was concluded that in general, the provision of outdoor meters would appreciably increase connection costs and would thus offset any saving in meter reading expenses.

*The installation "mock-up" produced by the North Western Electricity Board to demonstrate the installation of outdoor meters. Inside and outside views are shown*



# *Experience with Railway Electrification*

## Latest Information on the Manchester-Sheffield-Wath Scheme Presented at I.E.E.

SINCE its conception, in 1926, many thousands of words have been written detailing the Manchester-Sheffield-Wath railway electrification scheme. Ten years elapsed between the favourable 1926 report and authorisation to proceed with a revised scheme and two years between authorisation and work beginning. War, the reconstruction of Woodhead Tunnel and financial difficulties all conspired to hold up progress but now the major portion of the work has been completed and is running. Thus from concept to practical completion has taken 28 years and from authorisation to completion nearly 16. Despite the interruptions such a time lag can scarcely be justified, and such indeed appeared to be the opinion of many of the speakers in the discussion on the latest of the authoritative papers on the subject presented to the I.E.E. by Messrs J. A. Broughall and K. J. Cook.

The scheme is unusual in many respects, as it was originally specifically designed to cover the transport of heavy freight traffic—including mineral trains—over a heavily loaded line with steep gradients across the Pennine range. It had also to cater for suburban traffic and through passenger trains. The route itself is difficult involving almost continuously curving track and having at both ends of the line extensive freight marshalling yards and sidings, so that although the route mileage electrified is 68 miles, the single track mileage of running lines is 212 miles and of sidings is 88 miles. Signalling is naturally complex, involving 443 signals—over two per single-track-mile of running lines. The volume of traffic can be expressed as about 4·7 million trailing ton-miles per mile of single-track running lines per annum. To handle this traffic, after various postponements of parts of the scheme, 58 Bo + Bo and 7 Co–Co locomotives were provided together with multiple unit rolling stock for local passenger work.

### *Operational Results*

Some idea of the operation of the system was given by Mr C. K. Bird of British Railways who, however, pointed out that it was gratifying that the type and density of traffic envisaged in the basic scheme had not altered significantly. So far the full capability of the Co–Co locomotives had not been realised due to the speed limit of 65 m.p.h. imposed on the line. The drivers had shown considerable skill, and it had been found possible to increase the average speed of freight trains by 25%. Over the Manchester-Sheffield route there had in the period 20th September to 30th October, been a 27% increase in passenger traffic, and over part of the route served now by multiple rolling stock, receipts were up by 125%. Mr Bird's statement was greeted with loud applause, but the audience was brought back to earth by Mr C. M. Cock (English Electric Co.) who referred to the speed of the project. Allowing for the war, this had been at a rate of 7½ route miles per year. Before the war the Southern Railway had been able to electrify at a rate of 90 route-miles per year. General electrification of railways in this country was long overdue. There seemed to be an impression in the British Transport Commission that the delivery of equipment by British industry was an uncertain factor. The manufacturing capacity available was, in fact, ample and could be expanded. He suggested that it would be possible for separate groups to work to give a total rate of electrification of 300 route miles per year. Regenerative braking he thought should go down to much lower speeds than 16 m.p.h. Nevertheless, there was no doubt that the scheme would be a financial and operational success.

Some rather damping comments were also made by Mr S. B. Warder (British Railways) who hinted that all was not as well as it appeared. In his view as much electrification should be done as finance and technical resources would allow. There was no doubt whatever that there would be more electrification schemes and here the I.E.E. could help in finding young and enthusiastic engineers.

Comment on slow progress was also made by Mr O. J. Crompton (B.I.C. Construction Co.) who emphasised that the work on the overhead system had to move at a rate commensurate with progress on the Woodhead Tunnel. On the Manchester side the rate had been 32 track miles per year, while on the Sheffield side it was 28. One unit he thought should be able to do 80 track miles per annum.

### *Tyre Wear*

The vexed question of tyre wear requiring re-turning after some 40,000 miles running, then came to the fore, when Mr H. H. Swift, after remarking that from the films shown of the system in operation, the bogy of signal obscuration should be laid, said that in the Southern Region, tyre turning was not so frequent, and some had run 120,000 to 150,000 miles between re-turning. When the original scheme had been devised they had considered rheostatic braking using the starting resistors but rejected it for fear of overheating. He was interesting to see that experiments were being carried out again on this subject. He also asked if it would be possible for the global totals of cost given in the paper to be broken down into more detail.

Mr F. Whyman, of Metropolitan-Vickers Electrical Co., thought that tyre turning after 35,000 to 40,000 miles was indefensible on a Bo–Bo locomotive. Articulated locos of this type were badly thought of if they needed turning in less than 80,000 miles. He suggested the trouble lay in the bogies and that it could be cured by stiffening. A point of considerable interest was also raised by Mr Whyman when he asked why a steam locomotive could, apparently, be built for £20,000 to £25,000 whereas, to judge from the figures given in the paper, the cost of the mechanical parts alone for an electric locomotive appeared to be £15,000.

A suggestion that tread, rather than flange, wear was the cause of frequent tyre re-turning, was put forward by Mr E. S. Cox (British Transport Commission) and he thought that the unsatisfactory adhesion conditions might have something to do with it. He also brought up the question of train heating, a subject which had been referred to by Mr C. M. Cock previously who had proposed that the train heating boiler should be placed in a separate tender.

The problem of slip was brought up by Mr F. H. Bessant, who considered that a form of electronic control could be devised to synchronise the operation of leading and banking locomotives. Mr H. N. Cox, wondered why the authors had referred to oil-filled 33 kV cable as a probable substitute for solid type, but had omitted gas-pressure. Experiences in New Zealand formed the subject of Mr H. Elder's remarks, and Mr P. Bingley had some comments to make on the load-cycle used to specify the substation duty. He thought the same result could have been obtained by using B.S. 98, Class 3 loading plus four times the overload for 20 seconds.

# Wood as a Dielectric

ALTHOUGH replaced for many purposes by plastics, wood remains a constructional material of the first importance. Its continued use excites interest in many of its properties which were once of no conceivable importance. An example is provided by the latest publication of the D.S.I.R. Forest Products Research Board, Special Report No. 8, "The Dielectric Properties of Wood." The electrical properties of wood are of importance in high frequency heating processes, in the use of wood as an insulator, and indirectly, in connection with the use of electrical methods of determining moisture content.

Two quantities are needed to specify the alternating current behaviour of wood. They are usually taken as the permittivity and the tangent of the loss angle. The work described in Special Report No. 8 was concerned with the effects of supply frequency, grain direction, density and moisture content on these properties. The woods tested ranged from quipo (density 0·18 gm/cc) to wallaba (density 0·93 gm/cc). Included amongst them were Sitka spruce, Douglas fir and karri.

From the results obtained, it is apparent that the dielectric behaviour of wood is extremely complex, and cannot be fully explained at present. It is felt possible, however, to give a qualitative description of some aspects of the behaviour in terms of the dipolar and ionic mechanisms of electrical conduction. The former leads to a mechanism which is frequency-dependent, whereas the latter gives a conductivity independent of frequency. At the root of the dipolar mechanism suggested is a variation of the relaxation time of the many different asymmetric molecules concerned in a given species of wood. The theory suggests a broad maximum when loss angle is plotted against frequency and a slow fall in permittivity as the frequency is increased, and this is in fact found to be so. Both the tangent of the loss angle and the permittivity change only slightly over about seven decades of frequency, which on the basis of existing theory suggests that the conductivity should go up nearly directly as the frequency. This, again, is what is observed with wood.

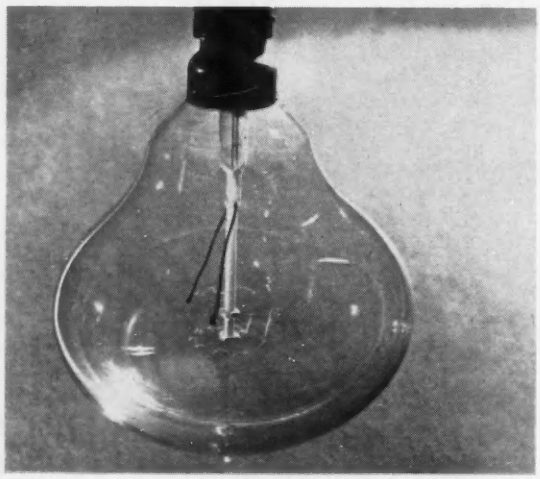
At high moisture contents (70 to 75%), the conductivity is found to be less dependent on frequency, and the conclusion is that it is mainly ionic in character. At intermediate moisture contents both ionic and dipolar conduction will occur, and theoretical treatment would be difficult.

# READERS' VIEWS

*Correspondents writing under a pseudonym are asked to submit their names in confidence to the Editor*

## *Information Wanted*

THROUGH the kindness of a good friend we have recently acquired for the E.D.A. Museum of Electrical Appliances an early "half watt" electric lamp which we understand was made under the trade name "Silvertown."



I should be glad if any of your readers can enlighten us as to the original makers of this lamp which has a bell-shaped clear bulb and a spiralised filament mounted in "double-deck" fashion. I should imagine it was made either before or soon after the First World War.

Any information that we could have which would enable us to catalogue this acquisition would be very welcome.

*John M. Fraser* (PRESS OFFICER),
E.D.A. 2 SAVOY HILL, W.C.2.

## *An Installation Problem*

THE comments by J. H. Robinson, on a letter of mine, suggesting the manufacture of hexagon-shaped ring bushes appears to require clarification. First, it is not possible to use ¾ in. lock-nuts other than the round type, inside loop-in boxes of more than two holes, as the sides of the lock-nut foul each other. Therefore a lock-nut cannot be used either side of the box, except the round type, which can only be tightened up with pliers. This leaves only the use of ring bushes inside the box and if these had hexagon sides a good job could be made of tightening them.

As regard some couplings having uneven ends. I would like to point out that it is usual to run a file over the end of the coupling and give a coating of graphite grease before mating on to the loop-in box.

*W. Satchwill,*
EASTBOURNE, SUSSEX.

## *Fluid-Filled Radiators*

I FEEL that in any argument on efficiency of heating methods, an important factor is purely physiological. The human body has, fundamentally, an optimum temperature for heat intake and the whole object of heating systems is to provide the maximum amount of B.Th.U.'s available at this temperature—probably in the region of 60-65° F. That is where, in my view, radiant heating systems fail, as they produce higher skin temperatures locally, leading to a general operation of the body-cooling mechanism with consequent overcooling of the non-exposed areas. The object should be, for comfort purposes, to heat the surrounding air so that a uniform skin surface effect can be established, and in achieving this object the fluid-filled radiator is fairly competent in that it converts, at good efficiency, the energy from its primary heat source to a more acceptable temperature.

*"Thermo-electric,"*
DARTFORD, KENT.

# Self-Regulating Alternators

## THE VOLTAGE REGULATION PROBLEM AND SOME SOLUTIONS—PART 2

By J. GRIFFIN, A.M.I.E.E.

SELF-REGULATING alternators are an alternative to the use of the conventional type of machine with an equally conventional external automatic voltage regulator. It is the purpose of this article to provide buyers and users of alternators with a general survey of machines of this type which are readily available in and from this country. In Part I a general discussion of the voltage regulation problem was presented, and some statically compounded alterators were described. In the present Part, commutator-type self-excitation is considered.

### *Commutator-Type Self-Excitation*

The rotating armature construction has for many years been generally accepted as the most appropriate construction for the small alternator.* Involving as it does the rotation of the armature windings in the stationary field system in a manner exactly similar to that of a normal d.c. generator, this construction makes "commutator-type" self-excitation possible.

In such a self-excited machine the armature slots contain, in addition to the usual a.c. winding connected to slip-rings, a relatively light d.c. winding connected to a commutator; the d.c. output from the brushes on the commutator is fed to the stationary field windings through a suitable regulator. The elimination of the separate d.c. exciter saves both space and weight—although the alternator itself must be a little larger to accommodate the additional winding and its associated commutator and brush-gear—and it also permits the use of external slip-rings.

This type of self-excited machine can of course be fitted with an electro-mechanical a.v.r., but owing to the absence of the normal exciter power amplification the a.v.r. has to handle the much heavier *alternator* field current instead of only that of the exciter, and it has also to dissipate the correspondingly much greater power loss. Nevertheless, outputs of up to 75 kVA are obtained with this construction by one manufacturer by siting a carbon-pile a.v.r. on the machine itself; the power loss dissipation capacity of the a.v.r. is greatly increased by passing some of the alternator cooling air through the regulator enclosure before this air enters the alternator proper.

BRUSH-SHIFT LOAD COMPENSATION.—The simple self-excited alternator, without any form of automatic regulator, is nevertheless suitable for a considerable degree of self-regulation or load-current compensation. By using as high a magnetic loading as is conveniently possible, a machine with an inherently fairly low regulation can be obtained; by self-exciting such a machine and shifting the d.c. brushes forward in the direction of rotation, advantage can then be taken of the forward shift of the alternator flux with load to increase the d.c. output voltage—and hence the field current—as the load increases.

In Fig. 9*a* are shown the combined voltage and m.m.f. vector diagrams for a relatively highly saturated alternator on open-circuit; it should be noted once again that the voltages are *time* vectors while the m.m.f.'s are *space* vectors, and it will be remembered that the vector manipulation of the m.m.f.'s is strictly permissible only when both the exciting and the armature reaction m.m.f.'s are substantially sinusoidal.† A further point is that Fig. 9 has been drawn throughout to correspond physically with the conditions obtaining in a rotating-armature machine, and the fixed direction of the exciting m.m.f. $F_E$ has been taken as the reference vector. Superimposed on the diagram are shown conventionally the d.c. commutator and brushes, and a field pole; the d.c. brush axis is coincident with the neutral or inter-polar axis, and the field pole and its exciting coil lie on the fixed exciting m.m.f. axis.

Fig. 9*b* shows the corresponding diagram for the same machine supplying its full power load at unity power factor,

*The superiority of the rotating armature construction is largely due to the $F_E:F_A$ ratio of about 2:1 obtained in balanced conventional designs. The exciting winding develops by far the greater m.m.f., and it is, therefore, logically placed on the stationary member, where there is available the greater winding space. The recent development of a wide-range control system permitting $F_E:F_A$ ratios as low as 1·2:1 eliminates some—though by no means all—of the incentive to use the rotating armature construction, but a detailed discussion of this point is outside the scope of this article.

† This point is particularly important here, because the magnitude of the load angle between the exciting axis and the no-load magnetising axis is the most significant difference between the salient-pole and distributed-field machines; in practice the load angle of the salient-pole machine is only about two-thirds of that predicted by distributed-field theory.

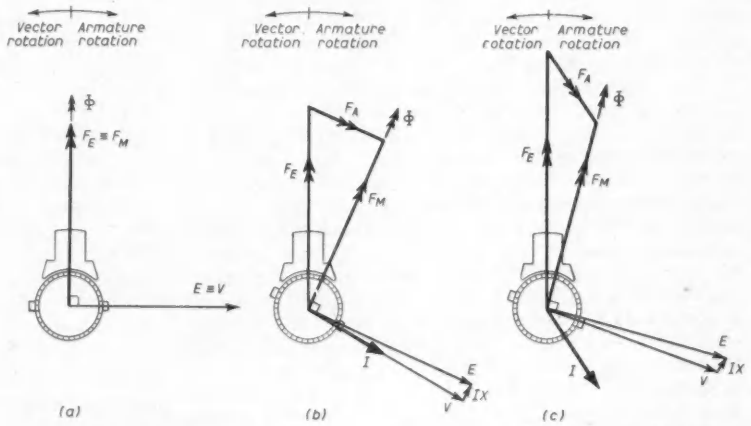



*Fig. 9. Commutator type of self-excitation; voltage and m.m.f. diagrams. (a) No load (b) Full load at unity power factor (c) Full load at 0·8 lagging power factor*

and it will be seen that the effect of the load has been to displace the flux and magnetising axis by some 25 electrical degrees. In the rotating armature machine the exciting m.m.f. axis is, of course, stationary in space, and the displacement of the flux axis (being backward with respect to the vector rotation) is forward in space, i.e. in the same direction as that of the armature rotation.

The e.m.f. induced in the d.c. armature winding is dependent on both the magnitude and the space position of the flux, the maximum induced e.m.f. being obtained only when the effective d.c. brush axis is at right angles (electrically) to the flux axis, as in Fig. 9*a*. It is, therefore, clear that if the d.c. brushes are left on the inter-polar axis the flux shift with load will effect a reduction in the induced e.m.f. and hence a reduction in the exciting current. If, however, the brushes are shifted permanently forward (as shown in Fig 9*b*) by an angle equal to the flux axis shift with load, the opposite and desired effect will be obtained, the d.c. output being at a minimum at no-load and at a maximum at full-load. The alternator field current will thus be automatically and progressively strengthened as the load is applied, and the voltage regulation will be considerably improved.

Unfortunately, this compounding effect is most pronounced at the high power factors which least require it; the flux axis shift for a given load current becomes progressively less as the power factor becomes more lagging (see Fig. 9*c*, drawn for ful-load current at 0·8 p.f. lagging), and at zero power factor there is, of course, no shift at all.

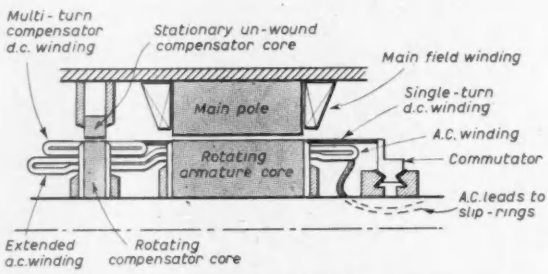



*Fig. 10. Sectional arrangement of machine having compensated commutator type self-excitation*

For any given brush setting, therefore, this type of compensation is correct at only one particular power factor, but by careful design proportioning a regulation of about 5% up at unity power factor and 5% down at 0·8 p.f. can be obtained. Adjustment to suit the actual site conditions can, of course, be made by altering the d.c. brush position, and with high-power-factor or constant-power-factor loads a better performance than the above is often obtainable.

VARIATIONS AND REFINEMENTS.—One manufacturer,* by using a specially designed machine, is able to improve the above performance figures to 2½% down at unity p.f. and 7½% down at 0·8 p.f. lagging. The design refinements include a highly saturated armature core, an unusually high ratio of core-length to pole-pitch (to reduce the effect of outhang leakage flux), and the very short air-gap made practicable by the use of a distributed exciting winding. The distribution of the exciting winding reduces the excitation efficiency considerably, but by increasing (by comparison with a salient-pole machine) the flux-axis shift with load the range of the excitation increase with load is extended, and the voltage regulation is improved. The distributed-field construction also results in an output waveform materially better than that of a similarly saturated salient-pole machine.

As an alternative to the forward shift of the main d.c. brushes another manufacturer† prefers to fit an additional brush set feeding an auxiliary field winding. The main field winding is connected in the usual way to the main brush set, which is left in the no-load magnetic neutral position, i.e. effectively on the inter-polar axis; an additional brush set, placed electrically at right angles to the main brushes, is connected to an auxiliary field winding, and the additional on-load excitation is provided by this auxiliary field.

In the no-load condition, when there is no a.c. armature reaction m.m.f., there is no voltage across the auxiliary brushes, and the necessary no-load excitation is provided entirely by the main field winding fed from the main brushes. On load, however, the forward flux shift already explained is experienced; the voltage across the main brushes is somewhat reduced, but since there is now a flux linking effectively with the auxiliary brush axis a voltage becomes available at the auxiliary brushes. By suitable design the additional m.m.f. provided by the auxiliary winding can be arranged to compensate for both the effect of the a.c. armature reaction and the effect on the main field m.m.f. of the reduced main-brush voltage.

A further variation adopted for small machines by other manufacturers constitutes a compromise between the simple brush-shift and the provision of a complete additional brush set; in this compromise design an auxiliary field winding is again provided, but this winding is fed from a single brush (per pole-pair) placed in the "third-brush" position familiar from its use in the self-regulating car lighting dynamo.

Several manufacturers extend the utility of their product by incorporating in the field system either a series winding or a compensating winding, carrying direct current. The machine can thus be self-started as a motor from the usual 24 V engine battery, and the separate starting motor and charging generator are no longer necessary. An ordinary series winding used for this purpose must be cut out of circuit after starting, its polarity being incorrect for generator operation; the compensating winding conveniently possible with the distributed-field construction may, however, be permanently connected, and the considerable complications of starting relays and additional terminals and connections are thereby neatly avoided.

COMMUTATION.—It will be appreciated that it is not practicable to provide machines of this type with interpoles; commutation has, therefore, to be effected solely by brush contact resistance. The alternator field and the d.c. armature winding are designed for relatively low voltage to mitigate this difficulty, and the d.c. winding is normally placed in the upper part of the armature slot to reduce its inductance. The commutation problem, and the increasing importance in larger machines of the relatively poor voltage regulation at lagging power factors, restrict considerably the outputs for which these machines can be economically built; an upper limit of about 35 kVA seems general, and most of the machines of this class are considerably smaller.

## *Compensated Commutator-Type Self-Excitation*

From the simple self-excited machine has been evolved an ingenious construction, incorporating what is in effect a phase-sensitive series-excited booster, in which almost perfect compensation for the effects of load and power

*Maggs, A. H.; "A New Close-Regulation Alternator," B.T.H. Activities, 1953, Vol. 24, p. 85 and p. 155.

† Hague, G. E. P.; "Square Path Alternators," Brush Technical Journal, 1953, Vol. 1, p. 32.

factor is obtained. In this self-excited compensated machine* an a.c. armature reaction m.m.f. is permitted to establish, in a separate and auxiliary magnetic circuit, a compensating flux approximately proportional to the load current, and an additional d.c. armature winding links effectively with more or less of the a.c.-produced flux according to the space position of the flux and its relation to the d.c. brush axis. By a suitable circumferential displacement between the d.c. windings on the main and auxiliary cores the additional on-load voltage available at the d.c. brushes is caused to be at its maximum (for a given load current) at zero power factor lagging, and at its minimum (neglecting for the moment the effect of a leading power factor load) at unity power factor. The alternator exciting current is thus varied in accordance with both the magnitude and the power factor of the load, and by suitable design an approximately constant terminal voltage can be maintained.

CONSTRUCTION.—The physical construction of this compensated machine is as follows: A self-excited rotating armature machine, basically of the type already described, is provided (see Fig. 10) with a separate and shorter auxiliary armature core in addition to that rotating under the main poles and carrying the main a.c. armature winding. The usual salient-pole field winding is provided, the axial length of the poles corresponding to that of the main armature core as shown. The magnetic circuit of the auxiliary or "compensator" core, however, is completed on the stator not by salient poles and the yoke but by a plain and unwound steel ring built up of high permeability laminations, and the air-gap between the rotating compensator core and the corresponding stationary ring is completely uniform.

The three-phase armature winding is extended from the main core straight through the compensator slots; in practice the d.c. winding on the compensator is heavier than that on the main core, so that it is necessary to make the compensator slots somewhat deeper than those on the main core, the a.c. winding being offset radially towards the shaft between the two cores.

The relatively light and usually single-turn d.c. winding on the main core is coupled in series with the heavier multi-turn d.c. winding on the compensator, but the connections between the two windings are offset by one pole-pitch circumferentially (see Fig. 11); a main-core d.c. conductor under, say, a *North* main pole is thus a virtual extension of a coil-side on the compensator in line axially with a *South* main pole.

OPERATION.—Consider now the machine supplying an a.c. load at zero power factor lagging. The m.m.f. of armature reaction is then in almost direct opposition to the main exciting m.m.f.; this armature reaction m.m.f., acting alone on a suitably symmetrical magnetic circuit, would clearly set up a sinusoidal flux stationary in space, proportional in magnitude to the load current† and of a polarity opposite to that of the main poles. In the magnetic circuit of the compensator the m.m.f. of the extended a.c. winding is in fact acting practically alone, since the m.m.f. of the d.c. winding is relatively small and is in any case not in direct opposition to the a.c.-produced m.m.f.; an a.c.-produced flux, stationary in space and with the same number of poles as the main field system, sinusoidally distributed, and proportional to the load current, is accordingly established across the compensator air-gap and in the rotating and stationary compensator cores.

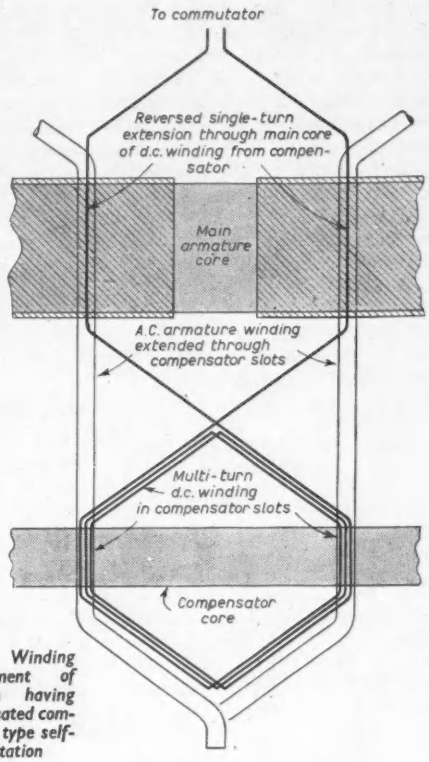

To commutator
Reversed single-turn extension through main core of d.c. winding from compensator
Main armature core
A.C. armature winding extended through compensator slots
Multi-turn d.c. winding in compensator slots
Compensator core

*Fig. 11. Winding development of machine having compensated commutator type self-excitation*

The d.c. winding on the compensator is, of course, rotating with respect to the compensator flux, and in consequence has a dynamically-induced e.m.f. developed in it; the one pole-pitch offset between the two windings ensures that in spite of the direct polarity opposition between the main and compensator fluxes (for the zero power factor load under consideration) the compensator e.m.f. is in the same direction as that in the "extended" d.c. winding on the main armature core. The output voltage at the d.c. brushes is thus increased, and if the magnetic circuit of the compensator is relatively unsaturated the alternator field current will be increased by an amount almost exactly proportional to the load current; by suitable design it will clearly be possible to maintain the alternator terminal voltage very nearly constant over the entire load current range at zero power factor.

Power factor compensation is obtained inherently from the change with power factor of the space position of the armature reaction m.m.f. The induced compensator e.m.f. will be at its maximum for a given load current if the effective‡ d.c. brush axes coincide with the positions of zero compensator flux, since the number of d.c. winding flux linkages is then a maximum; for the zero power factor load already considered, for example, the compensator e.m.f. will be at a maximum if the brush axes coincide with the neutral (inter-polar) axes of the main field system. At any other power factor the effective centre-line of the a.c. armature reaction m.m.f. is no longer coincident with that of the exciting m.m.f. (see, for example, Figs. 1 and 9), and the compensator flux shifts backward in space towards the inter-polar axis; this shift reduces the effective flux linkage with the d.c. winding, whose own axis is fixed in

*See Minchin, C. W. H.; "A Self-Excited Compensated Alternator," J.I.E.E., 1946, Vol. 93, p. 373, *and* British Patent No. 571,968.

† The m.m.f. of the d.c. winding in the compensation slots reduces somewhat that component of the a.c.-produced m.m.f. available for flux establishment; since, however, both the alternating and the direct currents increase with load, the departure from strict proportionality between current and flux is in practice quite small.

‡ The physical position of the brushes is, of course, dependent on the arrangement of the end connections to the commutator.

space by the brush position, and the d.c. output is thus progressively reduced as the load power factor increases.

By suitable design, and with a small permanent brush displacement to offset minor discrepancies between the required and obtained characteristics, nearly perfect load and power factor compensation can be achieved. A voltage regulation of less than 5% at any load or power factor is obtainable from the commercial version of this type of machine, and liberal compensator design ensures that ample capacity is available to deal with such short-time overloads as line-started induction motors. Test-bed or site adjustment of compensator output—to allow for minor variations in performance, or for line voltage drop or engine speed variation—is conveniently obtained by making the stationary compensator core capable of axial movement; the effective air-gap area can thus be adjusted and the compensator output thereby controlled.

Parallel operation between two compensated alternators of this type is readily obtainable in a manner similar to that employed with the statically-excited machine already described, i.e. by means of equalising connections between the two field windings; the connection is direct in the case of two similar machines or through a potentiometer where the machines are of appreciably differing outputs. Parallel operation with a conventional alternator is also possible, but it is then necessary to ensure that the power factor of the load on the compensated machine never becomes appreciably leading,* and to this end any conventional a.v.r. must be disconnected and the exciting current of the conventional machine so restricted that it secures only a limited share of the lagging reactive kVA.

*At power factors below about 0·9 leading the compensator output reverses, the alternator field current is reduced to below its normal no-load value, and the terminal voltage quickly becomes unstable.

*(To be continued, Part 1 appeared on 2 December)*

# Manufacturing Circuit-Breakers in America

MUCH general talk is heard about productivity in American industry; precise statistics for clearly defined industries are less easy to find. There is one outstanding source, however: the U.S. Bureau of Labour Statistics "case study data on productivity and factory performance," which is prepared for the Foreign Operations Administrations. The latest report is entitled "Three-pole circuit-breakers, circuit interrupters and safety switches." It is published in this country by the British Institute of Management, price 5s.

The products referred to are relatively small circuit-breakers with electromagnetic and thermal trips, ganged switches, and switch fuses. Experience in four factories is analysed. Much of the report is taken up with lists of detailed operations measured by man-hours involved, and these cannot be summarised here. However, the table gives the overall productivity figures. All four factories are housed in brick and concrete buildings, with a floor-space allowance of 120 to 280 sq ft per employee.

The four factories concerned in the study stated that about 60% of their sales consisted of circuit-breakers and switches. The remainder was accounted for by products such as switchboards, rectifiers and resistance coils. In general, only orders for standard products are accepted.

## *Self-Contained Factories*

All four plants are to a large degree self-contained. Almost all metal parts except "hardware" items (bolts, nuts, rivets, etc.) and springs are made within the factory, although plastic and non-metal parts are generally purchased from outside. Metal parts are sent out for plating and cleaning, and held in stock until needed. It is the aim everywhere to increase the interchangeability of parts in order to reduce manufacturing and inventory costs.

Operations on metal parts include blanking, stamping and forming, with cleaning and plating an occasional requirement. For a number of the operations, automatic presses are used, with outputs in excess of 1,000 pieces per hour. Assembly operations are broken down into a number of sub-assemblies, each of which is the work of one operator; though several may be concerned at the same point with producing a particular type of sub-assembly. Final assembly is normally a true line operation, with each operator responsible for the installation of only one sub-assembly or part. In a typical factory, terminals and stationary contacts are assembled directly on to the base. The centre pole of the three-phase mechanism together with its associated control devices makes up a sub-assembly which is attached to the base, and later outside blades, the trip mechanism, arc shields, handle and cover are added as further items or sub-assemblies. One effect of maximum use of interchangeable parts and sub-assemblies is that several related items can be assembled at once on the same final assembly line.

MAN-HOURS FOR MANUFACTURING 3-PH. CIRCUIT-BREAKERS, ETC.

| Plant and Product | Approx. Employment | Unit man-hour requirements | | |
|---|---|---|---|---|
| | | Total | Direct | Indirect |
| A—automatic thermal-magnetic circuit-breaker ... | 2,000 | 1·721 | 1·405 | 0·316 |
| A—circuit interruptor ... | | 1·087 | 0·888 | 0·199 |
| B—automatic thermal circuit-breaker ... ... | 3,600 | 2·590 | 0·989 | 1·601 |
| C—automatic magnetic circuit-breaker ... ... | 250 | 1·129 | 0·722 | 0·407 |
| D—fused safety switch ... | 700 | 1·824 | 1·119 | 0·705 |

*All products are 3 pole, 30 amp, 600 V for factory A; 3 pole, 50 amp, 250 V for B; 3 pole, 50 amp, 600 V for C and 3 pole, 30 amp, 575 V for D*

In Plant A (see table), 1,400 out of the 2,000 total workers are directly engaged on production. All these, except inspectors, receive a guaranteed minimum wage plus a share of a group production bonus. About 50% of the press-operators and assemblers are women, against 35% of non-production workers. Training is carried out by foremen "on the job."

This particular company has a staff of 22 in its engineering and design department. They handle basic research and the development of all new products, as well as preparing related drawings and specifications. 15,000 sq ft of floor area is given over to a laboratory, which deals with new production methods as well as development and testing projects. In addition to the laboratory establishment, there is a staff of 10 methods engineers.

In Plant B, 2,500 of the employees are production workers. Women account for only 15% of both production and non-production workers. A design staff of 18 responsible for circuit-breakers form part of a total design department of 250 working on all products.

# Ontario Hydro forges ahead

*46th Annual Report details 1953 Progress*

THE tremendous efforts being made by the Hydro-Electric Power Commission of Ontario to satisfy the ever-increasing demand for electrical power is well-illustrated in the recently issued Annual Report for 1953. Since the beginning of the expansion programme in 1945, the capacity of the system has increased by 84%. During 1953, an increase of 6·3% is reported, increasing the dependable peak capacity of the Commission's resources from 4,495,100 h.p. at the end of 1952 to 4,779,300 h.p. in December, 1953. The major part of this increase came from the new generating plant placed in commission at Otto Holden, Richard L. Hearn and J. Clark Keith generating stations. During the year under review 20,912m kWh were produced for load purposes, of which 16,263m were generated at the 63 hydro-electric and the 6 fuel-electric stations owned or operated by the Commission. Domestic consumers last year each used an average of 4,404 kWh, compared with 2,454 in 1945.

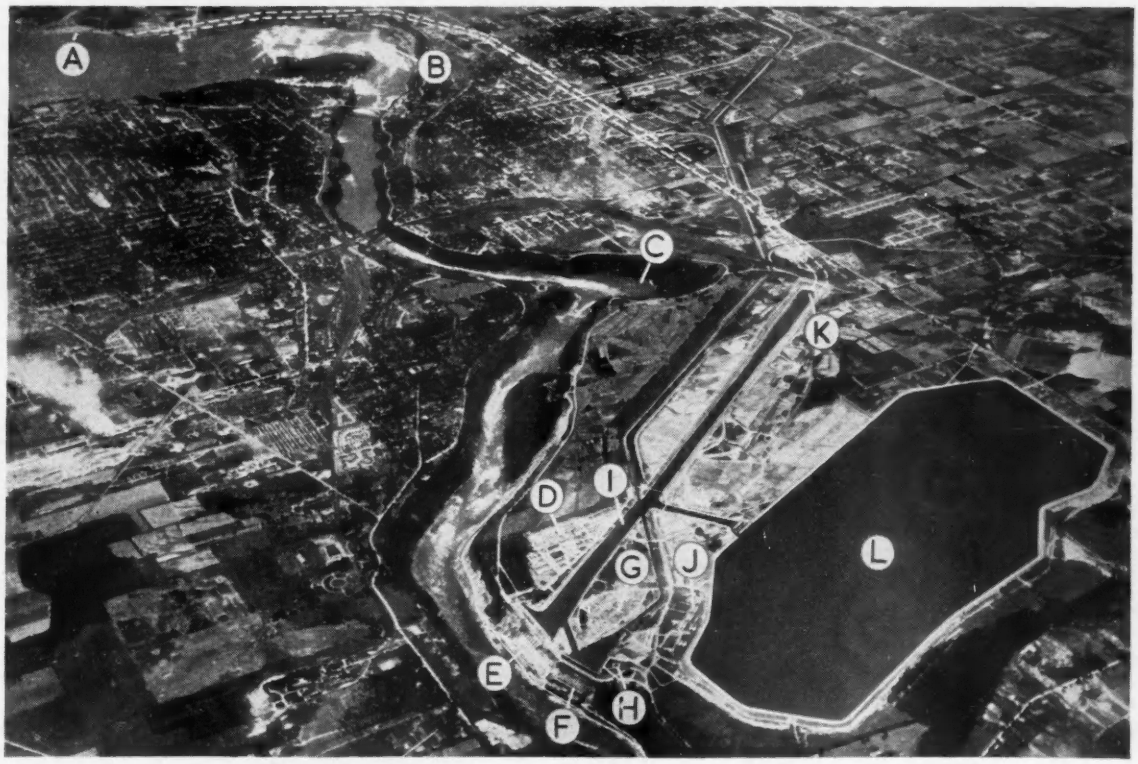
From its initiation, the Commission has adopted a conservative financial policy with reserves for depreciation, sinking fund, contingencies and rate stabilisation. The effects of the sinking fund reserve are such that if no further increase in power demand were to take place, the total debt would be paid off in approximately forty years.

The demand for power, however, shows no signs of abating and during the past ten years has necessitated a tremendous expansion of resources. Capital expenditure in 1953 amounted to no less than $184m, of which about 60% was spent on generating facilities. At such a rate of expansion, the total debt appears to increase at an alarming rate, although as the plant becomes revenue earning the sinking and depreciation reserve funds will grow. In 1954, it is estimated that the appropriations under these headings will be in excess of $35m, and will then increase annually by $5m during the next few years as the new Niagara Project with its associated facilities comes into operation.

At December, 1953, the assets of the Commission, after deducting depreciation reserves of $151m, amounted to $1,491m, and the long-term debt outstanding amounted to $1,040m an increase of $178m over 1952. The confidence placed in Ontario Hydro and the Province by Canadians is readily indicated by the speed at which bonds are bought. During the year bonds up to $200m were issued and sold, and up to August, 1954, a total of $1,080m in bonds had been sold, of which $830m were Canadian.

Progress in the frequency standardisation to 60 c/s was excellent, a total of 107,000 customers of all classes having been converted. This involved the changing over of 618,567 frequency sensitive items, and the exchange of 101,102 clocks, fans and other small items for new models. Thus at the end of the fourth year of the programme,

*Air View of the Niagara Project. (a) Intakes of Sir Adam Beck-Niagara G.S. No. 2, with dotted, the twin 5½ mile long tunnels (b) Canadian Falls (c) the Whirlpool (d) Work areas (e and f) Power Stations Nos. 2 and 1 respectively (g) the Switchyard (h) Hydro's Floral Clock (i) 2¼ mile long canal (j) Workers encampment (k) Exit portals of tunnels (l) Pumped water storage area*



375,718 customers or well over one-third of the total affected had been standardised. At the end of 1953, the programme involved the services of 2,317 employees (878 Ontario Hydro and 1,439 Canadian Comstock Co.) and required a fleet of 1,268 vehicles, ranging from jeeps to 15-ton tractor-trailers. Net cost of the programme at the end of the year amounted to $139m.

The major scheme under construction during the year was, of course, the Sir Adam Beck-Niagara Generating Station No. 2, details of which have already been published, and which was formally opened by H.R.H. The Duchess of Kent last August. When completed the ultimate capacity of this plant will be 1,370 MW in 16 units—including the pumped storage reservoir. Six units should be running by the end of 1954, six in 1955, pumped storage in 1957, and the remaining four units will be installed as required. Total estimated cost will be $344m.

### *Operation*

Despite major incidents, consisting of a fire, a tornado and a severe water shortage, service interruptions were kept to a minimum and the relationship between power demands and resources was the most satisfactory since 1945. The water shortage was partially alleviated by the commissioning of the fuel-electric plants and also by the interconnection with the Detroit Edison Co. This link, consisting of two lines, each with a capacity of 150 MW, became fully operative in September, 1953.

On 2nd March, a serious fire in the powerhouse at Chats Falls removed from service all the 230 kV lines terminating at that station, depriving the system of a frequency-changer and of the entire station output—a loss of 164 MW. On the morning of the next day, the 230 kV system was again operating, and by 21st March, seven of the eight generating units had been repaired and were again in commission.

In May, a tornado sweeping across the western half of the system blew down four towers on the 115 kV circuit between London and Stratford and sheet metal roofing was wrapped round the phase conductors of a 230 kV link.

Extensive fault-throwing tests were carried out on transmission lines to determine the effectiveness of a single-pole reclosing installation. With this scheme only the faulted phase is temporarily interrupted to clear a line-to-ground fault, the other two phases continuing to transmit power. The effectiveness of automatic generator voltage regulators was also investigated, and measures taken to correct system voltage fluctuations due to heavy loads such as are imposed by large welding installations and large motors. Tests were also carried out to evaluate special metering equipment for such loads.

An operations recorder was developed for installation at Sir Adam Beck-Niagara-G.S. No. 2, which provides automatically a record of both the time and character of operation of each important device in the station.

## Mobile Radio for Line Maintenance

THE highest transmission line in Britain is the North of Scotland Hydro-Electric Board's 132 kV link between Fort Augustus and Speyside which runs along the bleak and storm-swept Corrieyairack Pass, the pylon at the summit being 2,600 ft above sea level. Two small buildings erected near the top of the Pass contain repair material, heavy tools, food, fuel and bunks for the repair gangs. Each of these buildings is also equipped with a Marconi 5 W v.h.f. transmitter/receiver, type HP110, for communication with the gangs in the field.

When trouble occurs on the line, two repair vans, each with a Marconi 10 W transmitter/receiver, type H16 transport the gangs as far as possible up the Pass, whence they climb to the advanced base—the huts. Repairs are then carried out with communications maintained between the gangs, the huts and the vans using walkie-talkie radio equipment, type H19 and the other sets.

The use of short wave radio will greatly speed up the repair and maintenance of the line, particularly during gales, blizzards or conditions of heavy mist, and will enable most efficient and economic use to be made of men and materials. In the event of an accident the equipment would prove invaluable.

*(Right) Short wave radio installation in one of the huts*
*(below) Walkie Talkie set in use on the field*

# around the trade

by Peregrin

HIRE PURCHASE has been going through a bad patch lately. It has achieved the not uncommon distinction of becoming the target of abuse by one of our influential daily papers. This doubtless sincere but ill-informed attack has at least served to confirm that credit trading is now a well-established feature of our national life. Assisted wiring also has been in the news, for attempts have been made to revive this rather speculative method of attracting new consumers of electricity. Now why must these two forms of credit trading remain separate? Why is "H.P." still regarded as a means of purchasing an electrical appliance for use with an existing electrical installation, and "A.W." as a way of acquiring a wiring system with no specified use for it, very likely only a few lights. Why cannot the two be linked profitably, as they are in the United States.

Supposing a customer wishes to buy a refrigerator but has no wiring in his house. The electrical retailer need not lose interest. He can provide the wiring first, on condition that the customer buys a refrigerator, and he can choose one of several methods. He can carry out the wiring or have it done by a contractor, and charge it up to the "Utility," which is the private enterprise equivalent of our "Board." The Utility will reimburse the dealer and recover the cost from the new consumer by instalments. Meanwhile the dealer will sell the refrigerator on hire-purchase. Another way is through a bank. Many banks will finance the whole transaction, both wiring and appliance, but not separately. That is, they will not finance the wiring unless they also have the agreement for the appliance. A further method is through the usual finance house.

The wiring need not necessarily be an original installation. If a customer wishes to fill his house with expensive appliances, but his wiring is inadequate or worn out, the credit scheme will still help him, but in that case he must have a complete rewire. There is something novel and attractive about this cart-before-horse approach. At present we only woo the existing consumer and disdain the man who still finds gas good enough, or try to lure him to electricity before wasting any time on sales talk about washing machines or cleaners. Under this "H.P.-A.W." combination the correct approach seems to be to sell the appliance first and then get down to the question of providing current to work it. Electrical retailers might well give a little thought to the idea—for future reference.

## *Stocks for Christmas*

Future reference—yes, for just now most dealers are not so much concerned with new business as with obtaining the goods to fill their arrears of orders. With Christmas approaching it is a sore point in the trade, and each section blames the other for not maintaining an adequate stock. Some manufacturers contend that wholesalers and retailers should state their requirements in good time and order accordingly. The makers will not then have to decide for themselves whether to go all out at the risk of over-producing, or go cautiously along and risk an equally disastrous shortage. In short—tell us what you are likely to want and we will deliver the goods. The wholesalers are inclined to throw the blame on to the retailers' hand-to-mouth way of buying.

Those retailers with whom I have discussed this are emphatic. Why, they ask, should they have to take the risk of stocking a lot of expensive purchase-tax paid appliances, when the wholesaler is supposed to do that for them. Stock which may be left on their hands through cold snaps which fail to snap, heat waves which do not wave, reduction in purchase tax or other hazards of this electrical business. One dealer showed me a copy of the booklet "About this business of Wholesaling," published by the Federation of Wholesale Organisations, wherein it is defined how the wholesaler helps the retailer—"The Wholesaler guarantees the right stock at the right time at the right price." The wholesaler's experience also protects the retailer from "Bad buys." Well, that seems clear enough and my dealer friend certainly thought so.

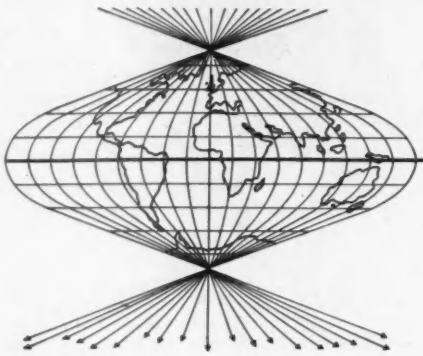
Another retailer defended hand-to-mouth buying on the ground that the customer does the same. A housewife does not call at the shop in July to say she will be needing a new convector in November, nor does a prospective refrigerator buyer start negotiating in January but is willing to wait till spring. No, the buyer buys when he needs the thing and not before. Therefore, the retailer cannot be expected to stock more than his reasonably likely needs, so long as he can telephone his wholesaler to have his stock replenished quickly. That at least is the argument.

Who should keep a stock? The dealer should of course stock at least a few of everything, the wholesaler should stock a lot of everything, while the manufacturer ought to —well, he ought not to mind if a stock does accumulate now and again, for in the end only he can create a shortage or prevent one.

Christmas has long ceased to be topical. Instead of occupying our thoughts for the last few hectic weeks before the 25th, as it should do, it has been publicised and commercialised since the end of September and by now we are getting rather bored with it.

All the same, electrical contractors have reason to regard this as the Season of Goodwill, for, after eight years of glaring at each other or ostentatiously ignoring each other, the Contractors and the Supply have buried most of the hatchets. some of which never really existed, and are now on very good terms indeed. One of the last strongholds, the Midlands, has just surrendered. At the Birmingham E.C.A. Dinner last month, the chairman of the Midlands Electricity Board, Mr. W. S. Lewis, announced a new agreement, under which the Board will sell cookers to the customers of contractors, for cash or hire purchase, the contractors receiving the full benefit of the sale and the wiring. This is indeed good news, and I am glad to be able to eat my words, deploring the seemingly non-co-operative attitude of the contractors.

May this Christmas present be well received by both sides, as an omen of a happy and prosperous future.



# OVERSEAS NEWS

### A SUMMARY OF IMPORTANT EVENTS

## CANADA

**Hopes in Labrador**

Results so far of a survey of water power prospects of the Grand Falls area on the Hamilton River in Labrador, confirm that conditions are favourable to a low cost hydro-development amounting to several million h.p., it was stated in London last week. The information was given by Mr E. L. de Rothschild, a director of the British Newfoundland Corporation, in which the English Electric Co., and British Insulated Callender's Cables Ltd., are among the more than 20 firms concerned. It was stated that survey work will continue next year, and if the Corporation decides to proceed with the scheme, a start could be made in 1956. Initially the scheme would probably involve about 1 million h.p., the cost varying between $150 and $250 per h.p. The potential capacity of Grand Falls is estimated at around 3 million h.p.

**Hydro Control**

The plans for development of Newfoundland have set the Provincial Government another problem. For some time the government has been worried about protecting Newfoundland's hydro-electric potential. Two engineers from the Hydro-Electric Power Commission of Ontario, on the invitation of the government, have submitted a report on the situation in which they suggest that Newfoundland should set up some sort of hydro control as soon as possible. The engineers recommended that a control body be set up to co-ordinate the existing companies and to manage a programme of rural electrification, but the Newfoundland Government have so far been unable to appoint a suitable man to head the proposed Power Commission. There are vast possibilities for power application, particularly along the coastline, but local reports indicate that there may be plans for some government subsidy for rural electrification as the cost of erecting the lengthy transmission lines would be high.

**Work in Quebec**

Sales of electricity for the first nine months of 1954 totalled 499,011,040 kWh an increase of 11·2% over the first nine months of 1953, Mr J. A. Fuller, president of Quebec Power Co., has revealed. Most of the year's work is well advanced, Mr Fuller reports. The new submarine cable to supply the Island of Orleans, and the additional 10,000 kVA transformer at the Limoilou substation are both in service. Construction of the Ste. Foy substation and extensive repairs to the dam at the Seven Falls power house are both nearing completion. The survey for the second 60 kV transmission line from Chaudiere power house to Lauzon has been completed; all rights of way for this line have been secured and construction is under way. The work which the company undertook for the Department of National Defence at Valcartier Camp on the department's high-voltage substation has been completed.

**Whatshan O.K.**

A complete inspection of the rehabilitated Whatshan hydro-electric plant on Lower Arrow Lake, has proved satisfactory, the British Columbia Power Commission has announced. The 33,000 h.p. plant was recently shut down for three days while engineers made a thorough appraisal of rehabilitation and improvements carried out following two mud slides which severely damaged the plant 15 months ago.

## EUROPE

**Power Project Reprieved**

In a referendum last weekend the Swiss electorate rejected by 504,000 votes to 230,000 votes, a proposal that the construction of the Rheinau electric power plant should be stopped. The electors were asked whether or not the half-built power station on the famous beauty spot should be demolished as it was alleged that it was spoiling amenities. Already, 52 million Swiss francs have been spent on the project, a joint Swiss and German scheme. It is estimated that the output of the station will be about 215 million units annually, of which 59% will go to Switzerland and 41% to Germany.

**Revision Needed**

Recent power development proposals for Greece have rather upset the country's electric power programme, we understand. The latest, the Ptolemais projects will now necessitate a complete revision of the programme, it is suggested. This follows the announcement by the Ministry of Co-ordination of the Ptolemais scheme, the main part of which is the construction of a 800 MW thermal power station, the design of which will be undertaken by the Public Power Corporation through its technical consultants, Abasco. This plant is a necessary pre-requisite for all the Ptolemais projects, as Krupps, and the Greek Fertilizer Co., which is co-operating with Krupps, have stated that the exploitation of the lignite minefields will only be profitable after construction of the power plant. This development was evidently not yet included in the power programme, nor was the 84,000 kW Megdova hydro-electric scheme for which a contract was signed recently, or the additional 60,000 kW turbo-generator and other equipment ordered earlier this year by the Athens-Piraeus Electricity Co. It would seem that the country's future requirement for electricity were under-estimated in the power programme.

## RHODESIA

**Studying Kafue**

In their study of prospects of the Kariba and Kafue hydro-electric projects, consulting engineers from Electricite de France, last week flew from Salisbury, Southern Rhodesia, to visit the Meshi Teshi gap area, some 30 miles west of Namwala, where the Kafue River breaks through a gap in low hilly country. It has been suggested that the region is eminently suitable for damming the flood water and the ordinary flow of the river.

## MIDDLE EAST

**Lebanon's Need**

The International Bank for Reconstruction and Development is to send a mission to Lebanon to study the possibilities of the proposed Litani hydro-electric scheme. This follows the request of the Lebanese government to the Bank for a loan of $30 millions for the project.

**Aswan Dam Scheme**

Experts from Germany, France and the U.S.A. who recently met in Egypt to consider the High Aswan dam project, have given their opinion that it is a sound project and ought to be carried out, the Egyptian Minister of Finance

has stated. He was announcing that three recently approved internal loans totalling £E25 millions will be offered for public subscription on 15 Dec. and will be followed by similar loans also to be used for financing industrial development and social projects. He added that foreign currency for these projects would be provided by: Egyptian balances of foreign currency now totalling over £E48 millions in free balances and £E141 millions in frozen sterling balances; external loans, or, payment in long-term instalments for capital goods.

## S.W. ASIA

### State Board

A State Electricity Board has been set up for Bombay, under the provisions of the Electricity (Supply) Act, 1948. Chairman of the Board is Mr M. H. Hasham Premji, who has been a member of the Bombay Electric Supply and Tramways Committee since the municipalisation of the undertaking. The two other members of the Board are Mr Pestonji C. Hansotia and the chief engineer of the Bombay Electric Grid. The Board will be concerned with the development of generation, supply and distribution of electricity within the State in an economical manner, and the rationalisation of the production and supply of electricity. Bombay is thus the fourth State in India to constitute an Electricity Board, the other three being Delhi, Madhya Pradesh and Saurashtra.

### Mysore's Problem

The urgent need to increase generating capacity in Mysore is shown in a study of forecasts of power requirements in the State, just published. This shows that although the present generating capacity is 179,200 kW, the capacity is limited to 142,000 kW owing to limitations of flow in the Cauvery River during summer months. Anticipated peak demand, taking into account normal development schemes, will be 147,050 kW at the end of 1955 and 163,520 kW at the end of 1956. Proposals are under consideration to take up the construction of the Shimsha New Project extension works immediately, at an estimated cost of Rs 345 lakhs. Installed capacity will be 42,500 kW. The Sharavathi Valley development scheme, giving 170,000 kW in the first stage of the Five Year Plan, is the only project of sufficient magnitude with adequate facilities for expansion up to 340,000 kW. Power development from the Bhadra dam site is to the extent of 17,000 kW, and the Tungabhadra dam site station and power canal station is expected to generate about 36,000 kW at present with the possibility of development to 54,000 kW, but whatever quantity of power is generated here only 20% of it will be utilised in Mysore State.

### Pakistan's Plan

The Pakistan Government has now decided to set up a Central Electricity Commission, and a Power Development Corporation, which are to operate somewhat on the lines of the British Electricity Authority, we learn. As we note on page 858, Mr C. E. H. Verity and Mr S. M. Rix, two senior officials of the B.E.A., are shortly going to Pakistan as advisers, and the services of a German electrical engineer, Dr W. H. Spidiel has also been secured by Pakistan under the United Nations technical assistance programme. Pakistan's proposed Central Electricity Commission will advise on the execution of all national hydro and thermal power projects, and will work in close co-ordination with the proposed Power Development Corporation. It will be an autonomous body invested with powers to put electricity development on a sound commercial basis. Pakistan has already made arrangements with two concerns for the preparation of power development plans — H. G. Acres in respect of West Pakistan, and the International Engineering Co. for East Pakistan.

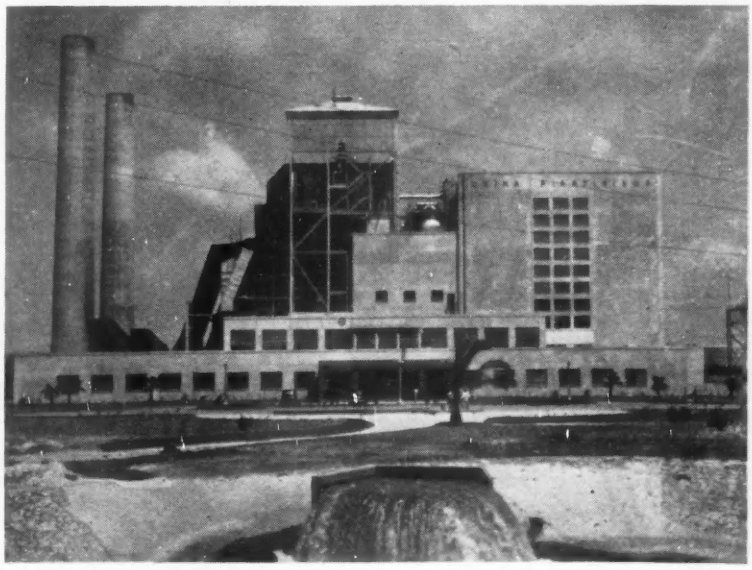
### More Power

The first of two Mirrlees-Brush 1,468 kW diesel engined alternators at the Siddirgunj power station near Narayangunj, was put into operation a few days ago by Mr Abbas Khalilee, secretary of the Pakistan Ministry of Industries. Two additional machines of the same capacity are expected to be in operation by the end of this year. Mr Khalilee said that good progress has so far been made in the development of power in the Province despite many handicaps. In this connection he paid tribute to the services rendered by the chief engineer (electricity), Mr W. C. Paton in the power projects of the Provincial Government. He added that six Deutz generators of 870 kW each had been in part operation since July last. These units were at present supplying power to the Adamji Mills. Two Deutz units of similar capacity were expected to be in full commercial operation at Chittagong by the end of this year.

## AUSTRALIA

### Rural Subsidies

A plea for increased subsidies in extending electricity to rural areas in Tasmania was made in the State Legislative Council recently. The member said the Hydro-Electric Commission was permitted, under the Act, to subsidise extensions up to £200 a consumer, but that provision had been inserted years ago since when costs had risen enormously. In view of the fact that the Government was prepared to assist secondary industries to the extent of thousands of pounds, he asked that it consider extending the limit of the subsidy so that people in outback areas could be assisted.



*The new Piratininga steam power station of the Sao Paulo Light and Power Co., Brazil, illustrated on the right, was officially inaugurated by the Governor of the State, Dr Lucas Nogeiro Garsez, last month. The power station has been built by a Canadian firm in the record time of 28 months—a record, that is, for an installation of its size and nature—to meet the rapid development of Sao Paulo. It is situated on the Pinheiros canal, close to the Pedreire pumping station, at an altitude of 2,000 ft above sea level. Now installed are two 100 MW General Electric 60 cycle turbo-alternators running at 1,800 r.p.m., and two 775 klb/hr Babcock and Wilcox oil-fired boilers operating at 900°F, 850 p.s.i. Provision is made for the installation of coal burning equipment if a suitable supply of such fuel is developed. Cost of the project is put at $20,150,000 (255 million cruzeiros), the greater part of which was used for the purchase of American equipment and which was raised in the form of a loan from the International Bank for Reconstruction and Development and guaranteed by the Brazilian Government*

# Personalities

## IN THE INDUSTRY

Shortly leaving for a two month visit to Pakistan, are **Mr C. E. H. Verity,** O.B.E., M.INST.C.E., M.I.E.E., M.I.MECH.E., deputy chief engineer (generation station construction), B.E.A., and **Mr S. M. Rix,** F.C.I.S., F.S.A.A., deputy secretary, B.E.A. They are to advise the Pakistan Government on the development of electric power in that country (see also page 857).

**Sir John Black** has accepted an invitation to join the board of Enfield Cables Ltd., and has been appointed deputy chairman of the company. He will assume responsibility to the Board for the executive control of the business. The appointment, it is stated, is not whole time but Sir John has agreed to devote to those duties whatever time is necessary for their effective discharge. It will be recalled that Sir John Black resigned from the chairmanship of the Standard Motor Co. Ltd. early this year, acting on medical advice following injuries received in a car accident. It is also announced that **Lord Verulam** has ceased to be a director of the company.

Further appointments in the composition of the new South of Scotland Electricity Board are announced. The appointments of **Mr J. S. Pickles,** B.SC., M.I.E.E., to be the new chairman, and **Sir Norman Duke,** K.B.E., C.B., D.S.O., M.C., as deputy chairman, were reported in our 5 Aug. issue, when other details of their earlier work were given. It is now stated that **Mr William Hutton,** M.A., LL.B., COMP. I.E.E. and **Mr W. S. Sawtell,** M.I.E.E., are to be full-time members, and **Col. J. G. Crabbe,** O.B.E., M.C., J.P., **Sir John Imrie, Mr Jackson Millar,** C.B.E., D.L., J.P., **Bailie John Sullivan** and **Sir Ronald J. Thomson** part-time members of the new Board. The new Board will take over on 1 April next the function of the present two Scottish area Electricity Boards. Mr William Hutton has been deputy chairman of the South West Scotland Electricity Board since its formation, and was earlier senior deputy town clerk with Edinburgh Corporation from 1939. Mr W. S. Sawtell has also served as deputy chairman of the South East Scotland Electricity Board since its formation. Earlier, he was for a year general manager of the Fife Electric Power Co., and prior to 1947, general manager of the Scottish Southern Electric Supply Co. for 24 years. Earlier he was with the Dundee Corporation Electricity Department. Col. Crabbe has been a part-time member of the South West Scotland Electricity Board since 1948. Sir John Imrie, a past-president of the Institute of Municipal Treasurers and Accountants, was city chamberlain in Edinburgh from 1926 to 1951 after which he was Local Government Commissioner in Trinidad for two years. Mr Jackson Millar, who has also been a part-time member of the S.W. Scotland Board since 1948, is the senior partner in the Glasgow engineering firm of that name, and chairman of Albion Motors Ltd. Bailie Sullivan has been a part-time member of the B.E.A. since 1952, having formerly been a member of the S.W. Scotland Board from 1948 to 1952. Sir Ronald Thomson, who has been a part-time member of the S.E. Scotland Board since 1948, has also been Convener of the County of Peebles since 1932, and chairman of the Scottish Special Housing Association for over two years.

**Mr C. Darbey** has just been appointed information officer with the Eastern Electricity Board. He was previously press officer for the S.W. region of the Central Office of information in Bristol, and before that P.R.O. with the Port of Bristol Authority.

Mersey Cable Works Ltd. announce that **Mr J. A. Reid** has joined them as sales engineer for the north-east coast. He commenced his career with the General Electric Co., with whom he served for over 20 years, and until recently was with Vent-Axia Ltd. Mersey Cable Works Ltd. also state that **Mr D. H. Wingrove,** who has been sales engineer for Yorkshire and the north-east coast will, in future, be responsible for the Yorkshire territory only.

**Mr Henry F. Spencer** has been appointed chairman of the British Institute of Management in succession to **Sir Hugh Beaver.** Mr Spencer is managing director of Richard Thomas and Baldwins, and a director of the Steel Company of Wales.

At present lecturer in electrical engineering at the Technical College of Monmouthshire, **Mr S. W. B. Leathlean,** M.SC. (ENG.), A.M.I.E.E., has been appointed head of the Electrical Engineering Department of the Brighton Technical College, with effect from 1 Jan. next, in place of **Mr W. A. Turner,** B.SC., M.I.E.E., who has resigned. In addition, **Mr H. L. White,** B.SC.(ENG.), has been appointed lecturer in electrical engineering at the Brighton Technical College, in succession to **Mr P. Godfrey** who has resigned.

**Mr H. R. Mallett** has recently retired from the service of Siemens Electric Lamps and Supplies Ltd. He joined Siemens Brothers Dynamo Works Ltd. in May 1907, serving with them until the war, during which he was with the R.F.A. gaining awards of M.C. and bar. Returning to Siemens in 1920 he stayed with them until 1923 when for a time he left the company, rejoining in 1931 this time with Siemens Electric Lamps and Supplies Ltd., becoming that company's representative for domestic appliances. In 1932 he devised and fitted out the first Siemens travelling showroom. He returned to the office staff in 1940, taking charge first of the Lamp Office and subsequently of the Heating Department. In 1948 he was appointed publicity manager for Siemens Brothers and Siemens Electric Lamps and Supplies Ltd., relinquishing

*Mr J. S. Pickles*

*Sir Norman Duke*

*Mr W. Hutton*

*Mr W. S. Sawtell*

*Mr H. R. Mallett*

that post on reaching the age of 65 years and serving as manager of the Lamp Company's Accessories and Heating Department until his retirement in November, 1954.

**Mr L. Satchwell** has resigned from the board of the Rheostatic Co., Ltd., for health reasons. Mr Satchwell founded the business in 1921 and his personal efforts were responsible for its growth and expansion until his retirement from executive management in 1947, since when he has continued to serve on the board of the company.

**Mr A. J. Counter,** commercial superintendent at the Cirencester office of the Southern Electricity Board, has been promoted to development engineer at the Swindon office.

Siemens Electric Lamps and Supplies Ltd., have appointed **Mr J. Hamilton** as joint manager for Scotland in conjunction with **Mr T. D. Childs** who is already well-known in Scottish circles as area manager for Siemens. Since leaving the R.A.F. in 1945, Mr Hamilton has been manager of the sales department of Walker, Sons and Co., Ltd., of Colombo, who are agents in Ceylon for Siemens Brothers and Co., Ltd.

The Ministry of Supply announces that **Dr A. G. Touch** has been appointed Director of Electronics Research and Development in succession to **Air Commodore W. G. Pretty.** Dr Touch has been Deputy Director, Electronics Research and Development (Air), since 1952. He will be succeeded in his present post by **Air Commodore C. A. Bell,** who was deputy director Communication Development (now D.L.R.D.) from 1946 to 1948. He is at present S.A.S.O., No. 90 Group, Air Ministry.

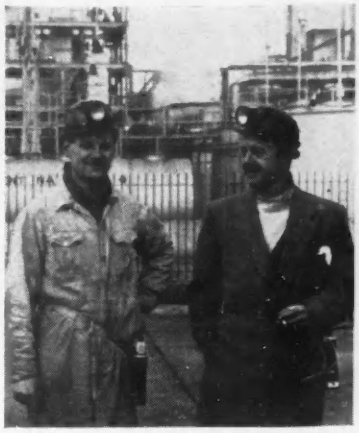
**Mr H. D. McGough,** who has been unanimously elected for the third successive year as President of the Society of Irish Electrical Traders, is well known in the electrical trade, being manager of the General Electric Co., Ltd., in the Republic of Ireland. Mr McGough is also chairman of the Executive Council of the S.I.E.T., as well as chairman of the Manufacturers' Section of the Society. He is a member of the Dublin Chamber of Commerce, the Illuminating Engineering Society, associate member of the Association of Public Lighting Engineers, member of the Executive Council of the Wireless Dealers' Association, and was Hon. Secretary and Organiser of the E.I.B.A., Dublin, from 1938 to 1951, and chairman in 1952 and 1953.

The accompanying illustration shows **Mr T. O. Freeth,** of the E.L.M.A. Lighting Service Bureau, with **Mr N. B. W. Castleton,** Cardiff branch manager for Cryselco Ltd., after making a three-mile tour underground to see the lighting at Nantgarw Colliery, near Cardiff, by special arrangement with the National Coal Board. Mr Freeth had just completed a series of popular lectures on lighting in Pontypool, Bridgend, Aberdare and Llanelly, at the invitation of the Bureau of South Wales Advisory Committee.

**Mr A. E. Camp,** principal assistant in the South Wales Electricity Board's Purchasing Department at head office, is shortly to retire after 46 years service in the industry. His successor is **Mr C. J. Plaisted,** formerly a senior assistant in the Purchasing Department. The Board also announce that **Mr H. Tomlin,** GRAD. I.E.E., an assistant engineer with the Yorkshire Electricity Board, has been appointed as first assistant district engineer, District 101/102 (Haverfordwest, Narberth, Milford Haven) in succession to Mr G. V. Vaughan, ASSOC.I.E.E., who is now district engineer, District 101/102.

Two new appointments are announced by E. K. Cole Ltd. as a result of the increasing scope of the company's activities and widening technical fields.

**Mr A. J. Brunker,** B.SC.(ENG.), A.C.G.I., D.I.C., A.M.I.E.E., relinquishes his position as general export manager to become chief engineer of the company, and **Mr W. M. York,** who as an executive director already controls the Publicity and Heating Division of the company, will, in addition, now direct the firm's export activities covering radio, television, plastics and cine equipment. In his new post Mr Brunker will be responsible to Mr A. W. Martin, M.B.E., technical director of E. K. Cole Ltd., and will assist him in the general administration of the company's Development and Engineering Department. Mr Brunker, who has had extensive engineering experience, retains his directorship in Ekco Electronics Ltd. Before joining E. K. Cole Ltd. in 1947, Mr Brunker was with the Ministry of Supply where, for several years, he held the position of deputy director, radio production.



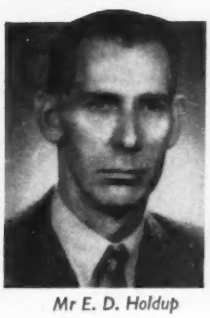
*Mr T. O. Freeth, right, with Mr N. B. W. Castleton at Nantgarw Colliery*

His many friends in this country will be interested to hear that **Mr E. D. Holdup,** M.SC., A.M.I.MECH.E., A.M.I.E.E., A.M.I.I.A., has now been appointed as station superintendent of the 400 MW "R. L. Hearn" steam generating station in Toronto, of the Hydro-Electric Power Commission of Ontario. He was station superintendent at the Commission's 264 MW "J. C. Keith" steam generating station at Windsor, from the initial commissioning in 1951, and the station reached the full capacity of four English Electric Co. 66 MW sets in October, 1953. Before taking up his post in Canada in 1951, Mr Holdup was station superintendent of Kingston "B" power station of the B.E.A., from its commissioning in 1948. He had held previous positions with the London Power Co., at their Deptford West and Battersea power stations, and also with the Central Electricity Board. We also learn that **Mr R. Shepley** has been appointed as station superintendent of the Commission's "J. C. Keith" generating station at Windsor, Ontario. He has been maintenance superintendent there since 1952. He was previously maintenance engineer at the Deptford West power station, and asst. mech. operating engineer at Battersea power station of the London Power Co. Prior to that he was responsible for major installations of steam power plant for the Metropolitan-Vickers Co., in various countries, particularly in Russia and in South America, etc.

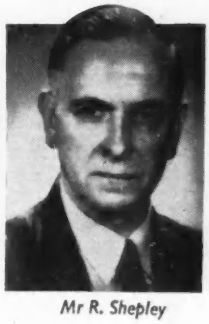
*Mr H. D. McGough*

*Mr A. J. Brunker*

*Mr W. M. York*



*Mr E. D. Holdup*



*Mr R. Shepley*

Mr A. G. R. Bell

Mr J. H. Barham

Mr J. L. Woollett

Mr J. B. Livesey

Mr S. M. Gore

Station superintendent at Bromborough power station, North West, Merseyside, and North Wales Division of the B.E.A. since June 1950 **Mr A. G. R. Bell,** A.M.I.E.E., A.M.I.MECH.E., has been appointed generation engineer (operation) Southern Group, South Western Division, in succession to **Mr P. L. Lutte,** who has transferred to the Northern Group. Mr Bell served an apprenticeship at the Sheerness and District Electricity Company's power station and in 1930 joined the Burnley Corporation undertaking as junior assistant engineer. He subsequently served in a number of electrical engineering capacities with the North-Eastern Electric Supply Co., the L.N.E.R., the South Lancs Transport and Power Co., the Lancashire Electric Power Co., and Coventry Corporation. On the establishment of the B.E.A. in 1948, Mr Bell was superintendent of Wallasey power station, holding that position till going to Bromborough in 1950.

The Telegraph Construction and Maintenance Co., Ltd., have opened three new branches, at the addresses noted on page 875. At the Birmingham depot, the manager is **Mr J. H. Barham,** ASSOC.I.E.E., who has represented the company in the Midlands for a number of years. The Nottingham branch manager is **Mr J. L. Woollett,** A.M.I.E.E., who was previously sales specialist with the Brush Electrical Engineering Co., Ltd., and earlier with Crompton Parkinson, Ltd. At the Cardiff branch, the manager is **Mr J. B. Livesey,** A.M.I.E.E., who was previously commercial manager with Balmer, Lawrie and Co., of Calcutta, and who earlier served with a number of other concerns, including Metropolitan-Vickers.

During a recent ceremony, **Mr Eric Robertson,** manager, London and the South East Area, the English Electric Co., Ltd., presented **Mr A. S. Gibson,** A.R.T.C., B.SC., A.M.I.E.E. (who retired from the company last June), with gifts from his colleagues at Queens House. These included a refrigerator, a radio set and a cheque. Mr Gibson, who was educated at the Royal Technical College, Glasgow, and Glasgow University where, in 1910, he obtained his B.SC.(ENG.), joined Siemens Brothers Dynamo Works Ltd. at Caxton House, Westminster, in June 1913. When that company became part of the English Electric Group he stayed on and, except for service in the first world war, he had a record of unbroken service covering over forty-one years. He is well remembered for his work on Government and Services liaison, prior to and during the last war, being closely

*Mr. A. S. Gibson, left, bids Mr. Robertson adieu*

connected with work on factory extensions for armament production, including aircraft, naval ordnance work, marine propulsion and general Service requirements.

Formerly with the B.B.C., **Mr P. A. T. Bevan,** B.SC., M.I.E.E., has been appointed chief engineer to the Independent Television Authority. Mr Bevan graduated in engineering at Cardiff University College in 1930 and then gained practical training at the Rugby works of British Thomson-Houston Co., Ltd. Since 1934 he has been a member of the engineering division of the B.B.C. and latterly was a senior member of their planning and installation department. He has been associated with most of their major engineering projects, and was one of the pioneer team responsible for developing the technical facilities for starting the B.B.C.'s television service from Alexandra Palace and for its subsequent expansion. He is the author of a number of papers in the radio and television field and has been awarded the Duddell Premium by the I.E.E.

At present deputy town clerk at Wolverhampton, **Mr S. Morton Gore,** LL.B., D.P.A., has been appointed to the position of secretary of the London Electricity Board, and will be taking up his new duties on 1 Mar. next. He will succeed **Mr W. H. Warhurst,** LL.B., whose impending retirement we exclusively reported on 30 Sept. Educated at Wolverhampton Grammar School, Mr Gore was articled to the town clerk on leaving school. At Birmingham University he took a double first-class honours degree as a Bachelor of Laws, gained first-class honours in the Law Society examinations, won the Clifford's Inn prize and the Wolverhampton Law Society's gold medal. He was appointed assistant solicitor to the town clerk of Wolverhampton in 1935, and 11 years later became deputy town clerk. In the early part of the last war, he was closely concerned with civil defence work, but in 1941 he enlisted in the R.A.F., was commissioned, and afterwards served for 3 years in South-East Asia.

The British Transport Commission announce that **Mr F. Q. den Hollander,** President of the Netherlands Railways, has accepted an invitation to become a member of the Commission's Technical Development and Research Committee. Mr den Hollander, who is also President of the Office for Research and Experiments of the International Union of Railways, is an outstanding figure in the transport world and his assistance on the Committee will help it to keep closely in touch with Continental practice. He was educated at Goes Grammar School, Zeeland, and at Delft Technical University. In 1918 he joined the Netherlands Indies State Railways and occupied various posts during the following twenty years. He returned to Europe in 1938 and was appointed assistant manager, Government Workshops, and in 1940 general manager. After the liberation of Holland in May 1945 he became permanent under-secretary to the Minister of Economic Affairs, and was appointed general managing director of transport with the Ministry of Transport in October 1945, general manager of the Netherlands Railways in 1946, and President of the Netherlands Railways in 1947.

Mr den Hollander has been honoured by the Netherlands, Danish and French Governments and is an honorary member of several British technical and professional institutions.

**Mr F. W. Dale,** B.SC., A.R.I.C., A.M.C.T., M.INST.F., has been appointed Divisional Chemist, North West, Merseyside and North Wales Division, B.E.A., and succeeds **Mr A. B. Owles** who recently retired. Mr Dale was Divisional Chemist in the former Merseyside Division, a

position he has held since August, 1948. Previous to that, he was with the Eastern Division as chemist and efficiency engineer at Norwich generating station.

The Minister of Fuel and Power has re-appointed the part-time members of the South East and South West Scotland Electricity Boards for the period to 31 Mar. next. These are **Mr R. W. McCrone, Mr G. McLaren, Sir Ronald Thompson** and **Sir Ernest Wedderburn** for S.E. Scotland, and **Mr R. Allan, Col J. G. Crabbe,** and **Mr Jackson Millar** for the S.W. Scotland Board.

## OBITUARY

**Mr H. Barker,** M.INST.F., manager of the Newcastle office of Babcock and Wilcox, Ltd., has died, aged 49. Mr Barker had been with Babcock and Wilcox since 1921, except for a short period in 1927 and 1928, which he spent in the Merchant Service, on the engineering staff of the *Berengaria*. He had had extensive sales experience in Leeds and London and was appointed manager of the Newcastle Office in 1950.

**Maj.-Gen. W. W. Foster,** who was until recently Power Commissioner with the British Columbia Power Commission for nine years, died in Vancouver, aged 79.

**Mr W. M. Horsfall,** M.I.E.E., who died on 1 Dec., retired from the position of sales engineer to Edison Swan Electric Co., Ltd., in 1935. Earlier he was for six years a consulting engineer with Robinson and Horsfall, of Liverpool, and engineer and manager of the Liverpool District Lighting Co., Ltd., for 13½ years.

**Mr I. G. Jones,** B.SC., A.M.I.E.E., district engineer for Anglesey for the Merseyside and North Wales Electricity Board, died on 3 Dec., aged 52. Born in Anglesey, Mr Jones studied at the University College of North Wales, gaining a diploma in electrical engineering, and after six years' experience with the British Thomson-Houston Co., Ltd., joined the North Wales Power Co. in 1935. With that concern he served successively as assistant mains engineer, acting district engineer, and mains engineer prior to 1948.

**Mr R. W. Temple,** credit manager to Hoover Ltd., died on 29 Nov.

**Mr G. E. Grace,** M.I.E.E., senior lecturer in electrical engineering at the Oxford College of Technology, died on 24 Nov. Before going to Oxford in 1943 he was lecturer in electrical engineering at the Bolton Municipal Technical College.

**Mr H. A. White,** chief draughtsman in the Stoke-on-Trent Electricity Department from 1927 to 1944, died on 22 Nov., aged 79.

**Mr W. Pursey Short,** district senior clerk at Taunton to the South Western Electricity Board, died recently, aged 66.

**Mr G. S. Ramage,** secretary and financial director of the Harland Engineering Co., Ltd., died on 19 Nov.

# NEW LITERATURE

### *Applied Thermodynamics*

*by the late William Robinson,* M.E., M.I.C.E., M.I.MECH.E.
*Revised by J. M. Dickson,* B.SC., M.I.MECH.E., A.M.I.MIN.ENG.

THIS text book, now in its third edition, covers the syllabuses of the B.Sc. (Eng.), Inst. of C.E. and I.Mech.E. examinations in this subject, and has now been revised and brought up to date. An entirely new chapter on "First Principles of Heat Transmission" has been added and the chapter on air compression modified to include gas turbines. This has also necessitated revision of the chapter on Internal Combustion Engines.

To the student of the above subjects, possession of this book is virtually an essential since the text was originally prepared with these examinations in view. However, practising engineers will find it of immense value for "brushing-up," or use as a reference. Treatment is, of necessity, fairly detailed and mathematics of a fairly advanced standard are required. Following introductory chapters on relationships between heat, power, work and properties of gas and vapour, the book gets into its stride. Air compressors, i.c. engines and gas turbines, and steam turbines are each devoted a section with chapters on preamble to give a complete understanding of each particular equipment. Refrigeration is dealt with in great detail and a final chapter on heat transfer completes this most useful book. Published by Pitman, 666 pages, 8½ in. by 5½ in. Price 40s.

### *The Simon Engineering Group*

*by A. Simon*

TO many in the engineering industry, one of the most disturbing trends in the last decade or so has been the everlessening contribution by engineers and technologists to top management, resulting in policy decisions being determined more by financial than engineering considerations. The wrongness of such a policy is amply demonstrated in this excellent book describing the Simon Group of Engineering Companies, where Lord Simon of Wythenshawe, in the introduction, is at pains to emphasise that the sixty-three managing directors in the Group are not only business men, but, equally important, engineers, each with a thorough grasp of the technical problems of that branch of the Company's activities under his control. Apart from the valuable contribution of Lord Simon's introduction, the book describes each of the ten departments of the two Companies (Henry Simon (Holdings) Ltd and Simon-Carves Ltd) which comprise the group. To the electrical engineer, that section concerned with power plant will, of course, be particularly fascinating. As a whole, the book is of historical value in illustrating the changes from the period when one man alone could build an industry by his own efforts, to modern times with its inevitable divided control. Published privately by the Simon Engineering Group, Cheadle Heath, Stockport, 119 pages, 8¼ in. by 6 in.

### *Clark's Tables snd Memoranda*

*Revised by P. Honey,* A.M.I.E.E., *and W. J. Woolgar,* F.R.SAN.I., A.M.I.S.E., M.I.P., R.P.

FOR technicians or craftsmen engaged in the building industry, this handy compendium in its new edition, provides virtually all the day-to-day information likely to be required on site. In fact, it seems surprising that so much material could have been packed into a volume, which takes up so little pocket space. Although much of the information is concerned with the civil and mechanical side of building, the electrical section, in itself, is a mine of data, giving useful installation tips and a brief survey of electrical heating and power appliances, together with a half-dozen or so tables for installation work. Tenth edition, published by Batsford, 400 pages, 4 in. by 2¾ in. Price 8s. 6d.

## BOOKS RECEIVED

**Transient Analysis of Alternating Current Machinery,** by W. V. Lyon. Applies Fortescue's method of symmetrical components, for designers and users of a.c. plant. Published by Chapman and Hall, 310 pages, 9 in. by 6 in. Price 56s.

**Everybody's Book of Electricity,** by R. B. Way. Introduction to principles of electricity and simple explanation, for laymen, of modern appliances and machines. Second edition, published by Percival Marshall and Co., 114 pages, 7½ in. by 4¾ in. Price 3s. 6d.

**Calcul des Petits Transformateurs** by R. Beyaert. In French, gives design of small transformers (up to 1 kVA) for e.l.v., electronic, rectifying and measuring purposes. Published by Dunod, 92 Rue Bonaparte, Paris (6ème), 398 pages, 9¼ in. by 6¼ in. Price 3,300 fr. (cloth), 2,900 fr. (paper).

**Electro-plating and Corrosion Prevention,** by E. Molloy. Provides a comprehensive guide to technicians and engineers engaged in modern plating practice and corrosion inhibiting. Published by Newnes, 278 pp., 8½ in. by 5 in. Price 18s.

**Electronic Measuring Instruments** by E. H. W. Banner. Survey of whole field of electronic measurements, for both instrument engineers, users with sections on nuclear work and other specialised applications. Published by Chapman and Hall, 395 pages, 8½ in. by 5¼ in. Price 45s.

**Fundamentals of Radar** by S. A. Knight. New edition of this book includes a chapter on waveguides with new material elsewhere. Of particular interest to service personnel and electronic students. Second edition, published by Pitman, 150 pages. 7¼ in. by 4¾ in. Price 15s.

# Equipment for Industry

## Portable Welding Plant

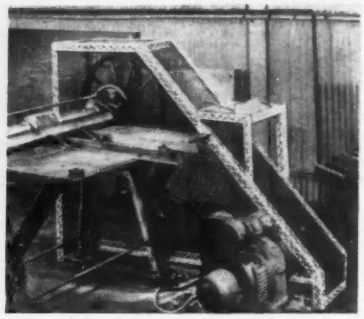
DESIGNED mainly for use in situations where it is convenient to take the welding plant to the job rather than the reverse, the new Quasi-Arc Type A.C.P.190 welding transformer set weighs only 250 lb. In this form, it is equipped with two lifting handles and for ease of portability, an undercarriage as illustrated may also be supplied, in which case the weight is increased by 8 lb. Air cooling and class B insulation are used throughout, the whole equipment being built to conform with BS.638. 1954 Group X.

In order to cater for wide variation in applied voltage, eight primary terminals are provided, and by means of a shorting strap, the correct tapping may be selected to handle inputs from 190 to 240 V and 380 to 480 V. Output is controlled by a selector device, which enables any of 35 different welding current values from 20 to 190 A to be chosen, and in the lower end of the range, variation may be effected in steps of as little as 1 A. A built-in capacitor, supplied as an extra, caters for power factor correction. The equipment is manufactured by the QUASI-ARC CO., LTD., Bilston, Staffs. Continuous maximum rating to BS.171 is 5·4 kVA. Normal continuous hardwelding current is 128·6 A. Overall dimensions without undercarriage are length 26¾ in., width 14 in. and height 23⅛ in.

*The new welding equipment is seen here with undercarriage fitted*

## New slotted angle uses chevrons

POPULARLY known as the "Meccano" of the engineering industry, slotted angle has firmly established itself as a structural medium for workshop use. This is probably due to the speed and ease of erection and the ability to use unskilled labour. The latest in the field to produce this useful equipment is CHEVRON STRUCTURAL UNITS LTD., 7 Victoria St, S.W.11, who claim advantages for this type of slotted angle, in which the slot takes the form of regularly interspaced chevrons. Of these advantages, the ability to be able to cut anywhere without risk of "blind-spots" for bolting and the special bolt which locks in the slot and enables single-spanner tightening to be effected, appear to be the most important. Other features are the adjustability and that the length may be seen at a glance, since each foot is marked and chevron holes are spaced one inch apart. The former feature applies to both flanges of chevron angle and is said to enable structures of all kinds to be erected, with precision. Standard shelves are available in various sizes, a "chevron" slot in each corner allows these units to be bolted to vertical bars. Two sizes of angle are manufactured 2 in. by 2 in. and 3 in. by 2 in. The equipment is now in full production and a demonstration showing versatility of its use is being held at the above address.



*"Chevron" is easily erected and noted for its adjustability*

## "Special Quality" stabiliser

AN announcement received from MULLARD LTD., Century House, Shaftesbury Ave, W.C.2, gives details of three voltage stabilisers and reference tubes which have been specially designed for use in equipment that is liable to be subjected to severe conditions of shock and vibration. These new tubes, electrically equivalent to types 85A2, 90C1 and 150B2, are being made in the "Special Quality" range to make them suitable for all Service and industrial applications. Some idea of their robustness may be gained since they are claimed to have been tested to withstand impacts of 500 g and vibrations of 6 g at the rate of 175/sec. The tubes are normally employed in electronic equipment to provide a source of stable voltage and are said to be noted for their long life, freedom from voltage "jumps" and close tolerance burning voltages. They may be supplied with pins or flying leads; type numbers are quoted below.

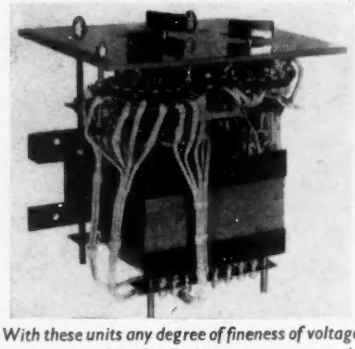
| | |
|---|---|
| M 8098 pin base<br>M 8142 flying leads | equivalent to 85A2. |
| M 8206 pinbase<br>M 8207 flying leads | equivalent to 90C1. |
| M 8206 pin base<br>M 8208 flying leads | equivalent to 150B2 |

Full scale production of these products will commence early in the New Year.

## Variable Voltage Transformers

WHERE an accurate or variable voltage is required for a service taking up to 20 kVA capacity, the new range of "Midco" variable output power transformers might be considered. These units, manufactured by the MIDLAND COIL WINDING CO., LTD., 4 Lancaster St, Birmingham 4, are already being employed on electric furnaces, to obtain fine control, and for accurate mass-testing of lamps, relays and solenoids. The system consists of a main transformer whose secondary is tapped and connected to a 15 way double pole switch such that equal steps of output voltage may be selected from zero to the full value. A typical standard voltage is 300 V, in which case each step is 20 V. Across one of the 20 V steps a further transformer and switch unit may be connected thus giving 15 subdivisions of the 20 V. Additional units may be connected in series to give the degree of fineness required.

Advantages claimed for these units are absence of brushes and shorted turns, and since resistive regulation is not employed, the losses are confined to those due to the transformers. Wherever possible, output of each unit is arranged to overlap the preceding output, to give full control by one switch, once the main selector has been set. The switches are said to be positive in action and may be operated on or off load, dependent upon the current output. Units may be contained all in one case or separately as required.



*With these units any degree of fineness of voltage output may be obtained to suit customer's requirements*

## Re-designed Thermovent High Temperature Panels

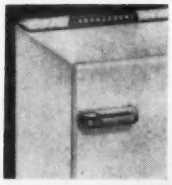
REPLACING the existing TV range, a re-designed range of Thermovent high temperature panels is announced by E. K. COLE LTD., 5 Vigo St, W.1. These new panels, type HTP, embody many improvements, including better heating insulation on the back tray, a new type easy to wire terminal box and one piece fixing brackets. They are available in wall mounting (horizontal, vertical and with guard) types and suspension types and in loadings of 600 W and 1,250 W.

## New Electrolux "Frig"

ATTRACTIVE newcomer to the Electrolux range of refrigerators is the absorption type L.230 2¼ cu ft model.

L.230 has a shelf area of 5 sq ft providing ample storage for an average family perishable food supply. It has a modern dust free "fared in" exterior measuring 3 ft x 1 ft 9 in. x 2 ft which contains the ample interior space augmented by two door shelves taking many of the smaller items which normally get in the way; they are ideal for eggs, boxes of cheese, butter, etc. The top and bottom shelves are adjustable in height whilst the centre shelf has a hinged flap to allow the storage of large wine bottles.

Fourteen good sized (¼ lb in all) ice cubes can be produced from the ice drawer which is fitted with an "easy releaser" device. In addition, three useful transparent plastic food containers with closely fitting lids are supplied for keeping food fresh within the "frig" which is kept sealed by the trigger handled door. The handle is easy to hold even with wet and slippery hands and responds to the touch of the thumb. Price for the L.230 introduced by ELECTROLUX LTD., 153 Regent St, W.1, is £57. 15s. inc. tax.



*These pictures of the new Electrolux L.230 show the styling and left the neat door catch. Right is a section of BTH Invertrunking showing use of T bolts*

## Heatrae Heating on a High Level

DESIGNED especially for safety by wall mounting in confined spaces the latest heater by HEATRAE LTD., Norwich, is appropriately named the "Saferod."

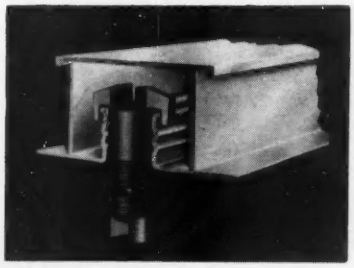
Loaded at 750 W, this new unit provides a flood of warmth from a wide reflector rather than a beam of heat. It uses a heating element of the "embedded rod" type which is almost indestructible and is especially suitable for bathrooms and other places where condensation occurs, as it is unaffected by damp. Of course the heater has many other applications which will be immediately obvious to the reader.

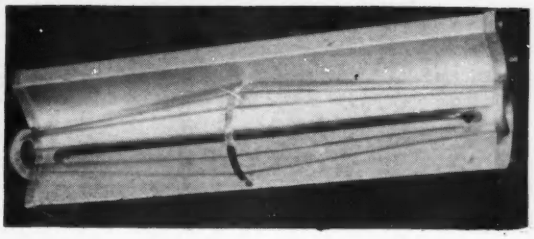
A special bracket is supplied to facilitate wall mounting. This is fixed permanently to the wall and suspends the heater which can be removed quite easily for cleaning and maintenance. The element is properly guarded in accordance with B.S. Specification and end plates are stove enamelled "mushroom" colour. Price for this heater which the company stress is not a "fire" in the accepted sense is only £3. 19s. net plus 28s. 10d. tax.

## The Moisture Master for drier air

COMPACT unit occupying 3 cu ft of space the Moisture Master Air Drier by CONTINENTAL COMPONENTS LTD., Hanover Bldgs, 35 Maddox St, W.C.1, removes up to 20 imperial pints of water from room atmosphere in every 24 hours.

Fitted with castors for easy movement the unit is most suitable for use in laundries, warehouses, cellars, work rooms and other situations where dry air is the prime need. The cabinet is finished in a neutral colour. Operation of the Moisture Master is simple, water, dust and pollen is removed from the air by the cooling coils and is led to the water drawer for disposal. The dried air then passes over the condenser coils where it is reheated and passed back to the room.





*Above right is the 1½kW Raydair heater whilst below are the "Moisture Master" left and the Heatrae "Saferod"*

## For the Electrical Trade

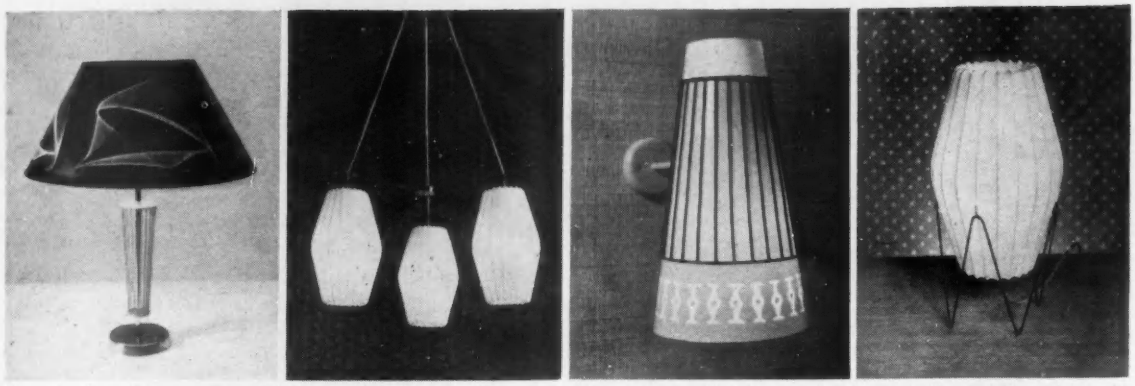
•

## Larger Raydair Greenhouse Unit Now

A LARGER 1,500 W version of the "Raydair" greenhouse heater has been introduced by BERRY'S ELECTRIC LTD., Touchbutton Hse, Newman St, W.1. This time it is a free standing model 30½ in. wide, 19¼ in. high and 7½ in. deep. It weighs 16¼ lb and is suitable for greenhouses up to 600 cu ft (approximately). Price is £9 and a thermostat suitable for use with this model is available at £2. 2s. both being tax free. As with the smaller model the heater is compact, waterproof and protected against rust. It is completely safe.

## Invertrunking is Mazda latest

DETAILS have been released by the BRITISH THOMSON-HOUSTON CO., LTD., Crown House, Aldwych, W.C.2, of the Invertrunking which has been



*Examples from the new range of fittings marketed this week by W. S. Chrysaline Ltd., 282 High St., Berkhamsted, Herts. Left to right: this attractive table lamp has a polished brass stem and base surrounded by a cage in mustard; the shade is in black with gold motif. Second photo shows a pendant fitting with three Chrysaline shades, the centre spacer is brass with metal stringers in red, sky blue and blueberry with silver cord flex. Third fitting is a neat wall bracket with red and white cord shade and metalwork in citron, mustard and blueberry. Fourth is a table lamp employing Chrysaline shade mounted on red, mustard, sky blue or blueberry hairpin base*

used to effect in their new Crown House showroom (see ELECTRICAL TIMES, Nov., 1954).

This is a new form of inverted trunking or ducting carrying wire cables, lighting and other electrical fittings which may be quickly and simply attached by means of T-Bolts.

It consists basically of a one-piece aluminium extrusion, which is joined by a channel section where necessary. A spring steel cover fillet completes the section when all wiring is in position.

Overall dimensions are: width 4 in., depth 1.11/16 in. Angle, Tee and Cross-over sections are available to order. "Invertrunking" offers a considerable range of flexibility, it may be mounted flush on to beams or structural ceilings, or cast-in-situ (when a protective coat of bituminous paint is necessary).

It has been designed with the suspended ceiling in mind, and the broad flanges support standard forms of ceiling tiles, such as those by Horace Cullum, Anderson Construction Co. and Frenger.

Circuit wiring may be inserted after the ceiling is completed and the use of the new type of B.T.H. connector block, called a Parablock, at intervals in the main wiring allows lighting layouts to be simply and quickly altered. Price is 4s. 3d. per ft.

## Atlas Portable Fluorescent Lighting

NEW Atlas portable fluorescent equipment has been developed by THORN ELECTRICAL INDUSTRIES LTD., 105 Judd St, W.C.1, to overcome disadvantages sometimes experienced with portable lighting using tungsten filament lamps. A major problem is the difficulty of siting without glare, particularly when more than one person is working in the vicinity of the lamp, whilst the ease with which a hot filament can fracture, and the relatively short lamp life, can also be troublesome and expensive factors.

The Atlas portable fluorescent lighting system provides the operator with a fully insulated portable lighting unit in which 2 ft 40 W fluorescent tubes are enclosed in clear "Perspex" cylinders.

These Atlas portable units are designed for operation on 110 V, 50 cycles, supply which normally has a potential of 55 V between each conductor and earth. The running voltage across the fluorescent tube is only 50 V.

## Plessey Dual-concentric Speakers

TO make available units for high quality reproduction THE PLESSEY CO., LTD., Ilford, Essex, has now completed production of two new dual-concentric loudspeakers, incorporating all the latest techniques. In the smaller unit a 12 in. cone is used for bass reproduction, and in the larger, a 15 in. cone.

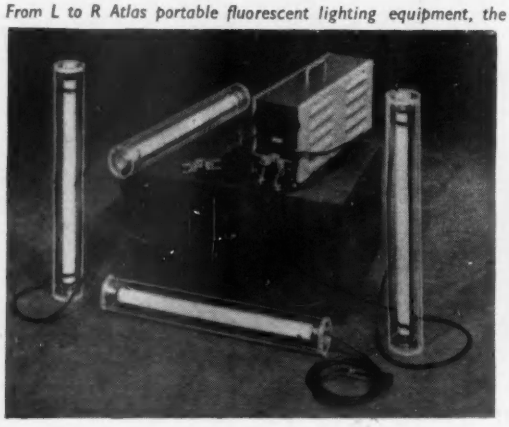
Each unit has a 6 in. by 4 in. elliptical loudspeaker, with a speech coil of aluminium wire, mounted concentrically with the low frequency cone, giving an excellent top note response with wide polar distribution.

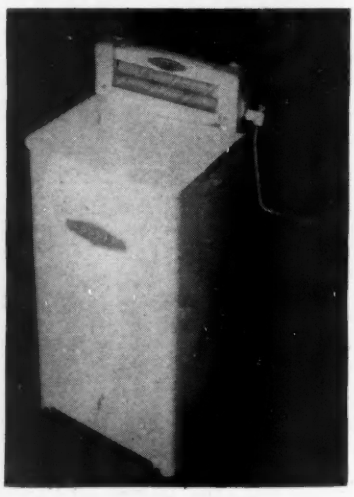
Wholesale and retail enquiries to AMPLION (1932) LTD., 230 Tottenham Court Rd.

## Low price "Wonder" Washing

CLAIMED to be the lowest-priced, full-size, washing machine available the "Wonder" unit by THE WONDER WASHING MACHINE CO., LTD., 228 Harrow Rd, W.2, certainly is not expensive. It sells at £20. 9s. 5d. which together with tax makes a total of only £26. 19s. Yet it can easily handle a 5 lb wash of clothes. It is powered by ¼ h.p. Hoover motor and washes by diecast tubulator in the base of the tub. It is mounted on four wheels for easy movement and has removable 12 in. wringer fitted together with useful table top stove enamelled white. Specially designed heaters for insertion in the tub are available at £6. 3s. (2 kW) and £7. 10s. (3 kW).

*From L to R Atlas portable fluorescent lighting equipment, the new Plessey dual concentric speaker and the Wonder electric washing machine*





# PROBLEMS AND PRACTICE

## In Engineering

### Motor Driven Regulator

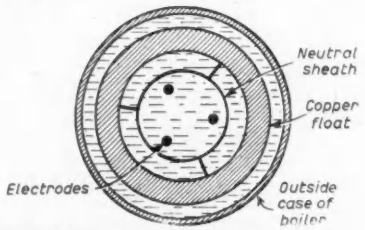
WE have in our mill a number of 75 h.p. variable speed 220 V, d.c. motors, driving papermaking machines. The speed is varied by two push buttons (lower and raise) which operate a 1/8 h.p. shunt motor, driving a sliding contact, through gearing, over the fixed contacts of the field regulator resistance.

The 5 A fuses controlling the armature circuit of the regulator motor, would occasionally blow, when the push buttons were operated, at odd times during the working week. To renew the fuses which are inside the starter panel, the main motor had to be shut down with consequent loss of production. After renewing the fuses one could play a tattoo on the push buttons and find it impossible to make the fuses blow.

In spite of close attention to cleanliness and increasing the fuse to 10 A, at least one of the four main motors had to shut down each week to renew fuses. A simple permanent cure was obtained about three years ago, by inserting in the armature circuit of each regulator motor one bar element, as used in ordinary reflector fires. This allowed enough current through, to operate the motor while restricting the initial surge to the region of 5 A.—*T. B. Brown.*

### Electrode Steam Raiser

ARRIVING at a farm to repair an electrode steam raiser, I found the following rather unusual symptoms. When switched on, the ammeter in the steam raiser supply registered 30 A and then slowly dropped back to about 7A. The steamraiser was of the floating electrode type, controlled by a 15 A, three phase contactor, the overload mechanism of which was not working effectively.




*Layout of the electrode steam raiser, with chalk forming between the three electrodes*

On dismantling the boiler I found that inside the neutral sheath containing the three electrodes was a solid mass of deposited chalk, (the area being in the South Downs, where the water supply has a comparatively high chalk content). The wet chalk deposit was obviously giving a low resistance path between phases and upon drying out, giving a high resistance. After cleaning out the chalk deposit and repairing the overload trip, the equipment then worked well.

Calling at the farm a few days later on another matter, I enquired of the health of the steam raiser, and was informed that, although it was working better than ever, the overload trip, shortly after it had been cleaned out, had had to be tied in. With a few pointed remarks about tying in overload trips, I thereupon investigated the equipment and found, to my surprise, that the ammeter was again indicating 30 A, although I had adjusted the position of the electrodes to obtain 15 A.

After a few questions to the farmer though, the cause was quite apparent. Each time steam was required, the boiler was topped up, and consequently the water in it was gaining in impurity content and hence giving a lower resistance at each use. After pointing out that the steam-raiser must be drained and refilled after each operation, no more trouble was encountered.—*W. Satchwill.*

*Every engineer has a story to tell; why not tell yours on this page? We welcome contributions to this feature, and those published will be paid for at our standard rates. Problems which are encountered and overcome in day-to-day maintenance or installation of electrical plant; useful methods and techniques developed for specific jobs, or current practices, all make instructive reading for others. We will also consider for publication problems requiring an answer. Sketches are often helpful and need only be rough, as they will be redrawn before use.*

### Drawing-In

WIRES are difficult to draw into conduit without damage particularly when it is nearly full to capacity. While a liberal supply of french chalk will help with the drawing-in if the conduit is smooth, a method I have found suitable for lubricating the conduit walls is to feed through a draw wire, then attach to it some pieces of cloth which have been thoroughly impregnated with french chalk. This is drawn through and will lubricate the conduit walls.—*W.E.W.*

### Paralleling Generators

I FEEL pretty certain that the generators used by "J.P." in the 14 Oct. issue were of the now so-called high efficiency type, which have low current fields. These machines have to be run to very fine limits of speed because of their high amp-turns ratio.

Possibly the generators were running too fast necessitating a high field control resistance which affects the pick up conditions of the machine. If the machines were run at lower speeds then obviously a stronger field would be necessary to produce the same voltage. A stronger field would, of course, be more stable and less affected by fluctuations from other machines and he would not then get the inter-machine surges of which he complains.

From my own experience of generators I would say that the main thing to bear in mind is to keep the field strength as high as possible so that any rise or fall of voltage on another generator has a smaller proportional effect. This goes against the salesman who relies on the word efficiency for his sales and will probably upset a few theorists but is sound practical sense.

As his machines are driven by a.c. motors with apparently no speed control I think "J.P." might overcome his difficulties by separately exciting them from another source — his rectifiers, possibly —and install a small exciter motor at a convenient position.

He should first check his brushes for the neutral position if not done already, and check his field control resistances by measuring the voltage drop across the fields when moving the controlling arm from one position to the next. If this drop is very severe this may possibly be the cause of his trouble and can be cured by replacing it with a controller having smoother action, remembering that if the voltage of one generator falls much below that of the other, even with the equaliser in circuit, there will still be a slight tendency for the compound winding of the lower speed machine to reverse its polarity and cause a surge sufficient to bring out the breakers. This chance is automatically taken care of by using strong fields.

As a final note I think he would be well advised to check and compare resistance readings of the compound windings with a low reading ohmmeter.—*C.L.D.*

### Switch Abuse

FOR reasons unknown at the time, the blades of a 30 A isolating switch at a d.p. distribution board had overheated. This condition had consequently burned through the spindle insulation and finally blew to earth. Satisfied that switch had not been overloaded, a replacement was made with one of identical make and capacity.

Having occasion a few days later to pass the factory section where switch was located, I observed a coat hanging from handle of same. On testing the feel of switch, it was obvious the blades were not quite home although making contact.

The coat was removed from handle and its owner duly cautioned.

Thus, one could quite reasonably assume that the innocent hanging of a coat on a switch handle, had created one more "panic" in the life of a maintenance "spark."—*R.W.B.*

# NEWS OF THE WEEK

## More Money Spent on Advertising

*ALL-ROUND INCREASE IN ELECTRICAL PUBLICITY*

INCREASED prosperity, higher rates of production, bigger demand and keener competition are well in evidence in the electrical manufacturing and supply industries at the present time. The healthy signs have inevitably led to an increased expenditure on advertising and amounts spent in recent months set against those of comparable periods in the past are remarkable. In the third quarter of 1953, the *Statistical Review* saw fit to draw attention to the marked increase in advertising of domestic electrical appliances, and that at a time when a total of £49,028 was estimated for July, August and September. Although those months are not the peak for advertising such products it is notable that the equivalent figure for 1954 is as much as £70,334. Before going further it should be mentioned that, the *Review's* section devoted to electrical appliances does not cover all manufacturers in that category. Many firms are included in other sections of that work.

Probably the best picture which can be given of this very considerable increase in advertising expenditure is derived from the comparative figures for money spent in the first six months of 1952, 1953 and 1954. These are given in tabular form at the foot of the page, and clocks and lamps excepted, all show increases. Biggest advertisers are undoubtedly the radio and television manufacturers whose expenditure appears to be increasing annually by some £100,000. Plenty of attention has also been paid to the washing machine which has cost its makers £54,144 more this year than last, and £50,000 more has been spent on publicising the refrigerator.

To return to the third quarter of the current year, one of the most remarkable growths in advertising concerns the dry shaver. We noted the expansion in this field of manufacture and the present trends in our issue of 28 October last. Five manufacturers of shavers spent a total of £44,200 between July and September this year compared with £31,511 during the previous quarter and a mere £13,782 in the July-September quarter of 1953. Money spent on advertising clocks jumped remarkably in September, reaching a total of £801 compared with £476 in September 1953. Lamp publicity is, of course, at its slackest during the months considered here.

A final word about the advertising of the supply industry, which has also increased in volume during the past 12 months, mainly since the restrictions on promotional advertising were lifted by the Minister of Fuel and Power. In that time advertising by the Area Boards rose from £19,132 to £30,958 in the third quarter of 1953 and 1954 respectively. Expenditure by both the B.E.A. and E.D.A. in the same quarters rose by no small amount, the 1954 figure of £63,443 being more than double the £30,845 of last year. It is to be noted that the nationalised Gas industry spent £170,490 in July, August and September last and £56,594 in the same months last year.

**JAN.-JUNE ADVERTISING EXPENDITURE**

| | 1952 (£) | 1953 (£) | 1954 (£) |
|---|---|---|---|
| Electrical Appliances ... | 75,333 | 100,544 | 148,621 |
| Clocks ... ... ... | 4,620 | 1,044 | 2,136 |
| Lamps ... ... ... | 57,126 | 50,924 | 48,120 |
| Refrigerators ... ... | 88,424 | 111,071 | 161,692 |
| Washing Machines ... | 52,219 | 96,042 | 160,186 |
| Radio and TV Sets ... | 221,150 | 334,296 | 424,489 |
| Vacuum Cleaners ... | 103,559 | 119,219 | 128,932 |

### *50% P.T. on Blanket Covers sold separately*

COVERS for electric blankets sold separately are to be chargeable for purchase tax as from 1 Jan. next. Hitherto the electric blanket has been chargeable at a rate of 25% and this has applied to the cover also if sold at the same time. If, however, the cover has been sold separately no tax has been charged. Customs and Excise have now informed blanket manufacturers that if the covers are sold separately they will be chargeable as domestic textile articles under Group 5A at 50%. Sold together they will be termed an electric appliance and be chargeable at 25%. No public announcement has been made.

### Committee to Co-ordinate Cathodic Protection of Underground Structures

RECORDS, although not yet complete, show that there are over 200 installations involving the cathodic protection of underground structures, and indications are that this method is being used more and more in this country. Current circulating in the soil due to such installations may accelerate the corrosion of other structures near at hand, and consequently it has become increasingly important to have some means of co-ordinating activities in this sphere. It has now been announced that a Joint Committee for such co-ordination has been established.

Membership has been confined to representatives of organisations or industries responsible for buried structures, and at present six are represented, namely the B.E.A., Transport Commission, Gas Council, G.P.O., U.K. Pipelines, and Water Research Association. A joint Technical Panel has also been set up as the findings of the Committee will eventually have to be made available as a Code of Practice. A representative of the six bodies already mentioned and Dr F. Wormwell, of D.S.I.R. as chairman, will constitute the Panel.

### Second Conference on Rural Electrification

A SECOND residential course on Farm Electrification is being organised by the E.D.A. at the County Institute of Agriculture, Winmarleigh Hall, nr. Preston. It will be held between 13 and 17 of this month and about 30 representatives of the N. Western Electricity Board, the Electricity Board for N. Ireland, and the Isle of Man Electricity Board will attend. Observers from the Merseyside Board will also be present. Those concerned with the present rapid rate of rural electrification development will receive oral instruction from experts and will be afforded the opportunity for group study and discussions on talks and demonstrations.

Those attending the course will be able to inspect the Institute's barn machinery and other power applications at the farm nearby. There will be three papers each day; two in the morning and one in the evening; and the afternoon will be devoted to discussion.

### *U.S. Instrument Show*

LOS ANGELES has been chosen as the centre for next year's conference and exhibition of the Instrument Society of America, Mr W. A. Wildhack, the president, has announced. It will take place between 12 and 16 Sept. Theme will be Instrumentation Paces Automation. Exhibit manager is Mr F. Tabery of 3443 S. Hill St, Los Angeles, Calif., under Dr A. O. Beckman who has been appointed general chairman. There is space for 467 exhibits.

## E.C.A. Branch protest Against Board/Council Liaison

ONCE again the Eastbourne branch of E.C.A. is protesting to the council over the S.E. Electricity Board's submission of tenders for Corporation work. The trouble has arisen over the council's practice of asking the Board to prepare specifications and to supervise the installation work. Contractors first raised the matter last Apr. and again last month; since when the council has requested further information before raising it at their monthly meeting.

The contractors maintain that if the Board prepare the estimates they should not tender for the work. They object also to the Board's supervision of work saying it is bad enough if the Board lose the job and then supervise their successful competitor, but even worse if they win and supervise their own work.

The most satisfactory solution appears to be that the council should have their own consulting electrical engineer, but this is considered an added and unwarranted expense for the taxpayers. The E.C.A. has suggested that they prepare specifications for the council. In which case various members of the Association would probably undertake the task in rotation and presumably not submit tenders.

## RADIO AND TV SALES DURING SEPTEMBER

THE boom in sales of radio sets has halted, but although sales in Sept. declined slightly compared with August they are still well above the corresponding month last year. Television sales continue to climb meanwhile and despite the high average in Sept. 1953 this year's equivalent figure remains in excess. The TV figure is in fact the highest ever recorded for the month of Sept. Average number of sets sold per shop last Sept., according to the latest R.T.R.A. data issued, was as follows:

| | 1954 | 1953 |
|---|---|---|
| *Radio:* | | |
| August ... | 12·29 | 7·1 |
| September ... | 12·13 | 8·41 |
| *Television:* | | |
| August ... | 10·76 | 6·19 |
| September ... | 12·94 | 12·12 |

## *Aberdeen prefers to Cook by Electricity*

THE principal of giving tenants freedom of choice between gas or electric cooking has not been in the news a lot recently. It was mentioned, however, by Mr G. R. M'Intosh, a member of the N. of Scotland Board, in Perth a few days ago when he commented on the success of an arrangement between the Board and Aberdeen Town Council, reached some four years ago. The arrangement was that as new houses became available the council gave the names of tenants to the Hydro and the Gas Boards at the same time. Both Boards approached the prospective tenant and when a choice had been made, the council installed the appropriate cooker. At first only a fortnight's notice was given but that period is now about two months.

During the first year of the scheme, said Mr M'Intosh, only 8% of tenants chose electricity. Since then the demand has steadily increased. During the nine months of 1954 up to Oct., nearly 60% of new tenants had chosen to cook by electricity. Mr M'Intosh suggested that these figures should provide food for thought in Perth.

## *International Congress on Refrigeration*

PARIS will again be the venue for the international refrigeration congress. The Ninth Congress International du Froid will be held at the Sorbonne between 31 Aug. and 15 Sept. next year. London has been the venue on two occasions. This time the general secretariat of the congress will be located at headquarters of the International Institute of Refrigeration, 177 boulevard Malesherbes, Paris.

## Gifts for Christmas

AT LEAST one large publicity campaign being carried on at the present time is advocating electrical gifts for Christmas. It is being conducted by the Eastern Electricity Board. Press advertisements have been running for some weeks now, but we have to hand this week some leaflets suggesting suitable electrical items as gifts. The illustrated lists range from cooking timers, table lamps, to cookers and refrigerators. Appliances are also listed in various price ranges.

## OFFICIAL PUBLICATIONS

DIELECTRIC PROPERTIES OF WOOD. Forest Products Research Report No. 8 published by D.S.I.R. for H.M.S.O. 1s. 6d. (see page 848).

BRITISH STANDARDS. B.S. 744, 1954: Electric Boiling-Plates for Domestic Purposes; B.S. 125, 1954: Hard-Drawn Copper Conductors for Overhead Power Transmission Purposes; B.S. 2538, 1954: Air-Cooled Flameproof Single-phase Lighting Transformer Units supplied from High Voltage Systems. B.S. 2519, 1954: Glossary of Terms and Notation for Toothed Gearing.

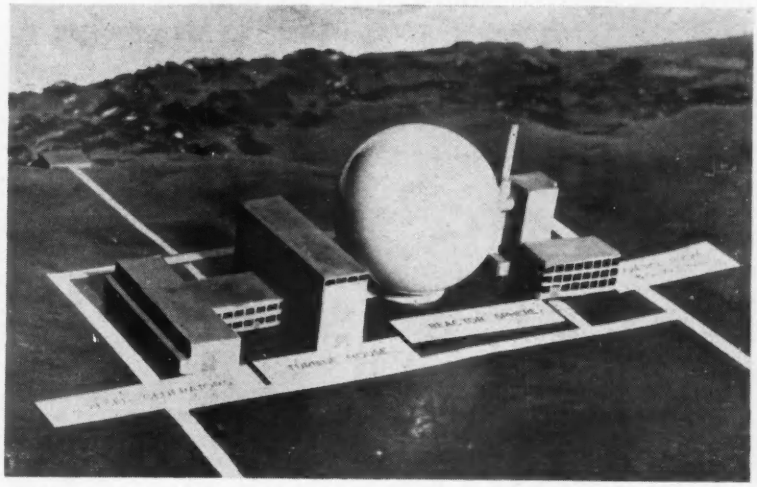
Amendment Slips: PD1983 (amending B.S. 731 part 1, 1952): Flexible steel conduit and adaptors for protection of electric cable; PD 2019 (amending B.S. 1193, 1954): Sizes of sensitised material for recording instruments; PD 2016 (amending B.S. 1788, 1953): Street lighting lanterns.

IRON AND STEEL SCRAP ORDER, 1954. (S.I. 1954/1593) (see page 868) H.M.S.O.

## Welsh Hydro-Electricity

PROPOSED hydro-electric schemes in N. Wales were discussed at two recent meetings of bodies whose objective is to preserve the rural countryside. Speaking to the Herefordshire branch of the Council for the Preservation of Rural England, Lord Merthyr said he started out as an opponent of stations in N. Wales but had altered his opinion. The case against such projects had been exaggerated and it was much better to adopt the attitude that although they did not like the projects they were willing to talk. He said there were too many people who maintained every structure should be opposed.

At Llangollen a short time ago Lady Megan Lloyd George, president of the Council for the Preservation of Rural Wales said the Welsh mountains were not there simply for the taking. Electrical engineers must have some regard to the setting, she said.



*A close-up of part of the model layout for the second atomic power station which is to be built at Dounreay near Thurso on the north coast of Scotland. This is the latest of the U.K. Atomic Energy Authority's works, and is now in the design stage*

*The model was exhibited at the Royal Institution, London, last Friday evening*

## A.S.E.E. introduce Technicians' Certificate Exam.

THE Swann Diploma Examinations organised by the A.S.E.E., which have been conducted in electrical installation and maintenance subjects, have now been extended to cover electrical manufacturing. Continuing their policy of encouraging education and training of technicians, the Association is to award Technicians Certificates. The examinations will comprise written papers up to a Higher National Certificate standard and these will be followed by oral examinations. Emphasis will be placed on knowledge gained by experience in installation, maintenance or manufacture of electrical plant and equipment, and on the candidate's ability to pass on the correct methods to others. Credits will be awarded to indicate qualities of responsibility and leadership, as well as technical ability, administration, and organisation.

It is intended that the Technicians Certificates will provide a suitable stepping stone towards the Swann Diploma. A brochure has been published setting out the syllabus of the Diploma and Technicians Exams, and these may be obtained from the A.S.E.E.'s general secretary at 23 Bloomsbury Sq. W.C.1.

## TV Service from N. Hessary Tor from 17 Dec.

TELEVISION service from the temporary low-power station at N. Hessary Tor will start on 17 Dec. The station consists of low-power vision and sound transmitting equipment installed in mobile buildings and a 150 ft mast to carry aerials. Regular test transmissions started last Friday, taking place between 10 a.m. and 1 p.m. and comprising demonstration films and still patterns accompanied on sound by music or tone. Transmissions are on Channel 2 at frequencies of 51·75 Mc/s vision and 48·25 Mc/s sound, vertical polarisation and asymmetric sideband system. The temporary station will serve an area of about 20 miles round Plymouth. The permanent station will extend the service to those parts of Devon not covered by Wenvo and most of Cornwall.

## TEACHERS' CONFERENCE ON ELECTRICAL APPLIANCES

THE policy of keeping domestic science teachers well informed about new domestic appliances is being strictly adhered to by the S.E. Electricity Board. A conference for the purpose of keeping teachers in the Board's E. Sussex and S.W. Kent sub-areas up to date was held recently at Eastbourne. Delegates were introduced to the latest types of appliances and brief technical details described by the Board's engineers. Practical uses of cookers, washing machines and similar appliances were explained by demonstrators, films were shown and discussions held. The conference was highly successful.

## *Prices of Iron and Steel including Scrap*

NEW maximum prices which may be charged in this country by iron and steel producers for the iron and steel products covered by 23 Related Schedules have been determined by the Iron and Steel Board. All previous prices have been revoked by the new Iron and Steel Board Price Determination 1954, No. 3. The changes became effective last Monday. Copies of the Determination may be had from the Board at Norfolk Hse, St. James's Sq, London, S.W.1, or from regional offices of the B.o.T. and Ministry of Supply.

Coincidentally, the Iron and Steel Scrap (Nos. 1-4) Orders, 1952-54, have been revoked by the Ministry of Supply. The new Order removes price control of wrought iron scrap and restricts price control of all other iron and steel scrap to material sold to or bought by consumers. Maximum prices of the better classes of iron and steel scrap have been increased by amounts varying from 2s. 6d. to 30s. per ton.

These latter changes have been incorporated in the Iron and Steel Scrap Order 1954 (S.I. 1593) published by H.M.S.O.

## New Power Plant is subject of Rating Case

AN APPEAL against the re-rating of the I.C.I. Ltd.'s Castner-Kellner works at Runcorn has been dismissed by the Lands Tribunal. Stating the case for I.C.I., Mr M. Rowe, Q.C., said the increase was largely due to additional plant and machinery. The question at issue was whether the electricity generated in the works was power within the meaning of the Plant and Machinery (Valuation for Rating) Order. The I.C.I. claimed it was not. 93% of generated electricity was used for trade processes, he said, and only the balance was used for motive power, lighting and heating. Mr M. Lyell, Q.C., appearing for Runcorn U.D.C and the valuation officer, said that their case was that firstly, when one generated electricity, one generated power, and secondly, that the actual process which took place in electrolysis (as at Castner-Kellner) was a use of power within the meaning of the order.

Mr Erskine Simes, Q.C., gave the Tribunal's judgments. He said they did not consider that "power" in the order had the limited meaning contended by I.C.I. But they were satisfied that the use of current in the electrolytic process rendered the current used a force or energy applied to "work," and "power" within the meaning of the order. In any case, the water tube boilers and steam turbines fell within Class 1(A) of the schedule of the order. They were satisfied that the whole of the machinery and plant in question was part of the hereditament under Section 24 (1) (A) of the Rating and Valuation Act, 1925. He accordingly dismissed the I.C.I.'s appeal and ordered them to pay respondents' costs.

The works were originally assessed at a net annual value of £39,333 and a rateable value of £9,853. It was proposed to increase these assessments to £56,600 and £14,150 respectively.

*Two examples of outdoor lighting designed by the British Thomson-Houston Co., Ltd. About sixty 80 W flameproof fluorescent fittings have been installed on two oil jetties at the Coryton Oil Refinery in Essex (left). They were mounted on special frames. Latest step in relighting the Staffordshire town of Wednesfield (right) comprised about 50 of the company's latest "Sapphire" lanterns housing 250 W mercury vapour lamps mounted on 25 ft Stanton concrete columns. Contractors for the street lighting scheme were the Midlands Electricity Board*

## Display of Portable Tools in Birmingham

CURRENT exhibiton at the Chester St, Aston, showrooms of the Midlands Electricity Board features portable and semi-portable electric tools. It was opened on Tuesday, and continues between 10 a.m. and 12 noon and 2 p.m. and 4.30 p.m. (excluding Saturday and Sunday) until 17 Dec. The display has been arranged jointly by the Board and Power Tools (Birmingham) Ltd., and among the wide range of equipment and accessories exhibited are drills, grinders, shears and nibblers, saws, spray painting equipment and blowers. There is also a special section devoted to tools of interest to the home handyman, and in this connection an evening session for the amateur will be held on 16 Dec. between 6 p.m. and 8 p.m. As usual, in the case of these exhibitions, prior notice should be given to the Board if it is intended to take a party.

## *Slogan Contest Results*

RESULTS of a competition held by Hoover Ltd. in the S. London area were announced last week. Competitors were asked to submit suitable slogans describing the benefits of the company's products. A condition of entry was that entrants should take advantage of the offer of a 2-days free loan of Hoover products. First prize was a TV set and other prizes included radios, refrigerators, canteens of cutlery and electric clocks.

*Following last year's complaints that London lagged behind other continental cities in her efforts to capture the festive spirit, Regent St has installed some 250 fittings which will brighten the days between now and Christmas. The lanterns measure about 5 ft in height and are made in gilded sheet metal and the patented Chrysaline plastic spray process by Chrysaline Ltd. They have been suspended on gilt brackets at first floor level and are in alternate colours of red, blue and green. The sides are decorated with white snow crystal motifs. They were designed by Beverley Pick Associates, and lamps were supplied by G.E.C.*

## Jubilee of Hull's Own Telephone System

JUBILEE of the Municipal Telephone Undertaking at Kingston-upon-Hull is being marked by an exhibition at the City Hall between 11 and 18 Dec. Hull's telephone service is unique in this country because it is the only one owned and run by the municipal authority, and in this capacity it has frequently been the subject of glowing accounts in the Press. Innovations introduced there include a cheap two-party line service, timing of the coin box call service, entertainment features comprising a Santa Claus story service and Phono-Diary which gives details of entertainment in the city, and cancer emergency system. The story of Hull's telephones would not be complete without mention of Standard Telephones and Cables Ltd. As Western Electric Co., that company made and installed all the main exchange telephone equipment and have continued to play their part in the modernisation and development of the service. Altogether the company have made and installed about 50,000 lines. Nor is development complete. Plans are in hand for a speeding-up policy to reduce the number of persons waiting for telephones. Over the next five years new exchanges will have to be built to cope with the increasing number of subscribers.

### The First Half-Century

The municipal exchange at Hull has been formally opened. The system was planned by Mr A. R. Bennett, who appears to monopolise all the municipal telephone work that comes forward. He estimated for a system with switchboard accommodation for 2,000 subscribers, a number that at first was thought rather excessive. Already, however, nearly 2,000 subscribers have been booked, and it is as well that provision was made whereby the switchboard could be easily extended. The system is chiefly underground, with overhead distribution, and involved nineteen miles of trenching, in which have been laid thirty-five miles of Sykes earthenware ducts with bitumen joints. Lead covered dry-core paper cables are used, the largest size containing 624 wires.—*From our issue of 8 December,* 1904.

### Sole Distributors

WE hear that Froyelectric Ltd., the electrical wholesalers established only last July, have secured their first "sole-distributorship." They have been appointed sole-distributors in London and Surrey for the Arcason dish-washing machine, made by Arcason Products Ltd. Pending further expansion the activities of Froyelectric are almost confined to the London and Surrey areas.

## COUNTY OFFICERS URGE ACTION ON FAULTY FITTINGS

THE Chief Constable and Chief Fire Officer of Westmorland have drawn attention to the existence of faulty electrical equipment in the county which has been causing unnecessary loss of life and fires. In a letter to the *Westmorland Gazette* they say that a number of people are killed each year through electrical equipment being in a dangerous condition and urge that all such apparatus be maintained properly. The joint appeal arose from a fatal accident in which the victim placed his hand on a faulty light switch. Following the inquest a number of property owners had their installations tested and fittings inspected, and some highly dangerous faults were discovered.

The county officers go on to point out that in addition to dangers from faulty fittings, many with standard lamps and portable apparatus trail flex (often unsuitable) under carpets and linoleum. They say these are hidden dangers there since the flex eventually chafes, causing short circuits, and possibly fires.

## *Inspection of Wiring in Winchester Prefabs*

A SURVEY of the electrical installations in permanent aluminium bungalows on the Springvale estate at King's Worthy is to be carried out by the Winchester R.D.C. The housing committee reported that they considered such a survey desirable following a fatal accident on the estate. A quotation of £22. 10s. for testing all electrical appliances owned by the council, rectifying defects, and also for testing and rectifying similar defects in apparatus owned by tenants, was accepted. The Engineer and Surveyor was asked to obtain quotations in respect of similar work on other "prefab" estates.

It will be recalled that last May the Ministry of Housing sent a circular letter to all local authorities reminding them of a previous request that these installations should be inspected periodically.

*New Bedford vehicles have been acquired by Tricity Cookers Ltd. for easy and quick transport of their appliances. Method of loading is to place three cookers on a special tailboard shelf which is hydraulically lifted to the upper deck. Eight such operations load 24 cookers into the upper part of the vehicle and a further 24 are similarly loaded in the lower part*

## NEWS IN BRIEF

New showrooms were opened at Oban by the North of Scotland H.E. Board last Monday. They were formerly the St. Columba parish church.

Electric cable has been laid beneath the pavement in front of one firm's premises in Bodo, Norway, to keep it free from snow and ice. The city is north of the arctic circle.

A special demonstration and exhibition of electrical appliances took place recently at the Liverpool works of English Electric Co., Ltd. Most popular feature proved to be the "Try It Yourself" section.

Premises have been opened at 4 Beresford Terr., Ayr, by G. E. Miles, the electrical contractor and retailer.

The 100 Good Catalogues Exhibition is on tour. It is now at Liverpool. Next month the exhibition will visit Cardiff, Derby and Wolverhampton, and its intinerary has been arranged up to next June.

Second annual dinner of the Derby Electrical Society took place recently at the Grandstand Hotel.

Action in the Eastern area over electricity charges is being urged by Yarmouth Chamber of Commerce. It is maintained that trade was being scared away from the district by high electricity charges.

Cookers and washboilers may be omitted from council houses to be built in Lanarkshire following an appeal for more economy made to the county council by the Secretary of State for Scotland.

N.E. London branch of A.S.E.E. held their annual dinner at the Angel Hotel, Ilford. There were 93 members and guests present. A past chairman's certificate was presented to Mr D. H. Taylor and inscribed compacts to ladies of the five former branch chairmen.

British Electricity (Didsbury) Sports and Social Club presented their first production at the Manchester Area Electricity Club recently. The play was Peter Blackmore's comedy, "Miranda." This newly-formed amateur dramatic society hope to follow up their first success with a second next spring.

A man pleaded "guilty" at Padiham Magistrates' Court last week to attempting to steal copper cable from an electric pylon. He lost his right arm in the attempt. The man was conditionally discharged on payment of 15s. costs.

Concert presented by the London Electricity Sports and Social Association last week at St. Pancras Town Hall proved most enjoyable. There was wide variety in the programme, and particularly popular were the community singing and the choir's rendering of "A Cowboy Carol," arranged by Sir Malcolm Sargent.

Negotiations are proceeding between Liverpool City's Engineer and the Merseyside and N. Wales Electricity Board for the tenancy of one of the shops being built at Southdene, Kirkby, for use as a service centre.

## *Scottish Board makes Special Appeal to Youth*

AN Electricity Exhibition is being run this week by the S.W. Scotland Electricity Board in the Grand Hall, Kilmarnock. It was opened by Provost Gilmour on Tuesday and remains open until Friday. Yesterday evening girls on the Board's staff provided an attractive mannequin parade. Each afternoon there are numerous demonstrations of electrical appliances, notably cooking and laundry equipment. A special feature will be the final of the Salesmanship Competition on Friday. This contest was organised for local Youth Club members to interest them in salesmanship as a career and incidentally to the electrical way of life. The competition, together with the children's electric cooking contest, held annually, is an excellent indication of the Board's strenuous activities to educate the younger generation in the advantages of electricity.

## Seeboard to Publicise Ring Circuit Wiring

THE S. Eastern Electricity Board is publicising the ring circuit system of wiring in a series of advertisements in the local Press. It has been felt that insufficient attention has been paid to this system of wiring houses and the Board is consequently attempting to point out the advantages of the system. There will be a series of three advertisements directed first to builders, then to architects, and finally a general advertisement. They will be inserted in local papers between now and the spring. Particular attention will be paid to Kent and parts of Sussex, where special interest lies.

## *Queen's Speech debated in the Commons*

ENCOURAGEMENT for the building and improvement of technical colleges and stimulation of the expansion of facilities for higher education are amongst the relatively few proposals of engineering interest which were made in the Queen's Speech at the opening of the new session of Parliament last week. Another promise was legislation to authorise an increase in the borrowing powers of the British Transport Commission. Apart from these matters, any other new legislation directly affecting electrical engineering is hidden beneath the usual phrase "other measures will be laid before you in due course," and in the chances of the ballot for private members' bills.

One of the most interesting contributions during the debate on the Address in reply to the Queen's Speech came from Sir Albert Braithwaite, who spoke on Friday, when colonial affairs was the main topic. He noted recommendations of a U.S. Commission that profits from investment in under-developed countries should be subject to reduced taxation, and called on the Chancellor of the Exchequer to look into the matter of such special concessions in Great Britain. On a general point, he said that the rate at which capital goods are pouring from the United States into the British Commonwealth is something about which we should be very alarmed. He contrasted the treatment of low British tenders for work inside the United States with his allegation that "the Americans have done 85% of the major work in the British Commonwealth since the war ended."

On the subject of education, the Minister, Sir David Eccles recalled that relaxations now being introduced would expand the amount of new building which could be started for technical education by about £2½ m. a year. Sir David did not deal with higher technological education.

Some comments about the British Standards Institution were made by Miss Elaine Burton, with special reference to the Consumers' Advisory Council recently set up. She suggested that the B.S.I. had been let down badly through lack of leadership by the Government, who should have given the Institution power to enforce the compilation of standards considered necessary for the protection of consumers.

The Debate was continued.

# ELECTRIC SUPPLY NEWS

### East Yelland

Work on the East Yelland power station of the B.E.A. is ahead of schedule in some departments, and it is now estimated that the project will be completed in 1957, much earlier than planned. Of the six 30 MW turbo-alternators scheduled for installation, three are now operating. Two more are planned for 1956 and the final one for 1957. Work on boilers is about seven months ahead of schedule, and the generators are being completed a little earlier than expected. Six boilers of the 11 planned are operating, and four more are going in by 1956. Fears expressed at the start of the project that the completed structure would spoil the beauty of the Taw estuary have not materialised, it is stated. Some way from the Bideford-Barnstaple road, the power station blends surprisingly well with its surroundings, and is seen at night as a blaze of light and colour.

### Glasgow

The extension to Glasgow Corporation's Pinkston power station was formally inaugurated last Friday by Mr Thomas Johnston, chairman of the North of Scotland Hydro-Electric Board. The station supplies electricity to the Corporation's tramcars, trolley buses and underground system. The development, which has been carried out over the past five years, is estimated to have cost over £2,223,000. The new extension consists of one 30 MW Metropolitan-Vickers turbo-alternator generating at 6·6 kV, three phase, 50 cycles, and two John Thompson 150 klb/hr boilers. The second boiler, however, is not expected to be ready for service before 1956. Its erection cannot begin until an existing boiler is removed. The new plant replaces 25-cycle equipment, and the distribution network has been reinforced accordingly. Originally the Corporation proposed to install more 25 cycle plant.

At the opening ceremony, Mr Johnston remarked that the change-over from 25 cycles to 50 cycles was a wise move, and if used to the fullest, would add to the power resources of the West of Scotland and contribute to the elimination of power cuts and shortages. Given goodwill, it should be a simple matter to maintain the prior purpose for which Pinkston was erected and financed and locally controlled as part of a great municipal enterprise, and to dispose of its surplus power at a fair and reasonable price to the new South of Scotland Electricity Board. Later that evening, at dinner in the City Chambers, Mr Johnston advised the city councillors to give serious consideration to the proposals for electrification of the suburban and underground railways.

### Lake District

A scheme to bring electricity to the Langdale Valley and the Hartsop and Deepdale areas of the Lake District will start next year, the Lakes Urban Council has been told. The lower end of the valley will have electricity within 18 months, but the rest of the scheme will take up to five years to complete.

### Northern Ireland

Proposals for utilising the waters of Strangford Lough for a hydro-electric scheme would not be a practical economic proposition, Lord Glentoran, Minister of Commerce, has stated. The Minister added that the civil engineering work involved in the project would cost approximately the same as that for the Severn Barrage, i.e. 50 millions, as, although a shorter dam would be required, the depth would be much greater and the problem of constructing it rendered much more difficult by virtue of the fact that at maximum flow the current is about seven knots. The power that could be generated was estimated at between 50 and 70 MW, assuming complete utilisation of the potential power. This power, however, would only be generated for two five-hour periods every 24 hours, which would vary with the tides, and, therefore, the dependent network would have to be capable of dealing with this load at any time of the day or night. At Strangford the tidal range of the equinoxal springs is about four metres, or about one-third of that of the River Rance (France) or the River Severn. If, therefore, turbines of similar size to those proposed for the Severn barrage were installed at Strangford the output would be slightly less than one-third that of the Severn, and as the capital cost would be approximately the same the capital cost per kW of power generated at Strangford would be considerably greater than that for the Severn Barrage scheme, which in itself was not regarded as economic.

## *Sayings* OF THE WEEK

*"I say this without any feeling of animosity, but the rate at which capital goods are pouring from the United States into the British Commonwealth is something about which we ought to be very alarmed."* . . . SIR ALBERT BRAITHWAITE, M.P., during the debate on the Queen's Speech.

*"In the fuel economy of the country electricity provides the one bright spot, as of all the fuel industries it alone is reasonably sure of its raw material in the future."* . . . MR PHILIP HONEY, opening a discussion at Lambeth Town Hall.

*"Registration of professional engineers would be beneficial to both the profession and to the public."* . . . MR R. A. H. JACKSON, vice-president of the Engineers' Association in Eire.

### North of Scotland

The 20,000th electricity consumer to be supplied in the North of Scotland Hydro-Electric Board's northern area, was connected to the distribution system recently by Sir Hugh Mackenzie, deputy chairman. He is Mr J. Urquhart of Bunloit, who lives in a croft on Loch Ness-side. Over 83% of the possible connections in the Board's northern area have now been made and progress is continuing steadily.

### North Wales

Within the next four years a further 2,320 premises, including 1,100 farms, in the Merseyside and North Wales Electricity Board's rural area will have mains electricity, Mr R. N. Pegg, manager of the Board's No. 4 sub-area, has stated.

### Portishead

A local hearing is to be held into the proposal by the British Electricity Authority to purchase approximately 31 acres of land on Portbury wharf for ash disposal. The Portishead Planning Committee is perturbed at the problem resulting from ash dumping. The committee is opposing a proposal to use about 6½ acres of land off Gas Works Rd as an ash dump and for the manufacture of breeze blocks. Members of the Planning Committee fear that the primary purpose is the storage of ash and that the manufacture of breeze blocks would occupy only a small area. Contractors, they say, are building up ash dumps in every available place and the B.E.A. should be asked to reconsider the system by which ash contracts are let.

### South Shields

The North-Eastern Electricity Board has prepared plans for a power supply to the Newcastle Road area. A revised estimate of the cost is £4,660 which has been approved by the Corporation Town Improvement Committee.

## LIGHTING SCHEMES

**Chelmsford.** The R.D.C. has approved in principle proposals to convert gas street lighting to electricity at Ingatestone.

**Howden.** The Parish Council is making application to borrow £1,300 for the provision of electric street lighting.

**Llanrwst.** The U.D.C. is to consider a scheme to modernise street lighting.

**Rochdale.** The T.C. is recommended to borrow £6,195 for the provision of sodium lighting in certain streets on new estates.

**Walthamstow.** The Council has received consent to borrow £12,000 for sodium lighting on main roads.

**Wisbech.** The T.C. has approved a new scheme for lighting in Norwich Rd, estimated to cost over £3,600.

# COMPANY ACTIVITIES

THE big company news of the week was the warning by the Siemens' board to shareholders not to deal in their shares as they could expect an offer for them from the giant Associated Electrical Industries. Siemens' shares shot up from 38s. 6d. to 43s. Associated Electrical are around 61s. A.E.I. paid a market premium when it bought a £450,000 block of Siemens' shares from the Custodian of Enemy Property in 1951, much to the disgust of Siemens' directors. They were precluded under company law from doing anything like that. All they could have done was to offer an equivalent of the market price, through intermediaries, and resell them to their shareholders. But A.E.I. stepped in and were able to extend their activities into branches of engineering where representation had been small. Since then there has been co-operation, with an A.E.I. representative on the Siemens' board. But it was not 100% happy. Perhaps A.E.I., by making a generous offer, will now make amends. Judging by the market price it does not look as if Siemens' shareholders will be offered a one-for-one exchange, although there is always that possibility. Siemens is one of our oldest electric undertakings. It was nearly 100 years ago that Sir Wm. Siemens began to make telegraph instruments.

An interesting situation has developed in Brook Motors. Mr Frank Brook, the chairman, in his annual statement to shareholders said that at the current rate of demand for the company's products—a.c. electric motors and control gear—they will soon be setting up new output records. At home, increased costs are being absorbed by modern methods of production. And it will soon be necessary for additional manufacturing capacity to be built. So far, so good. But the company is also engaged in the difficult operation of breaking into the American market. Its American subsidiary was owing the parent company £108,500 as at September last. And the next year will be the testing time. Good luck.

Sir John Black, the man who built up the Standard Motor organisation has become deputy chairman of Enfield Cables. Sir John is to assume responsibility for the executive control of the business. Meantime, Enfield trading results for the current year, according to Sir Philip Warter, the chairman, will not be satisfactory. But a substantial loss incurred in the first six months did not continue in the second half, owing to various measures initiated by the reconstructed management. Preference dividends can be expected for the year but there is unlikely to be any Ordinary dividend.

The Pye group is certainly going places. Latest development is a plan to raise no less than £1·5 millions in Preference and Deferred shares. Terms of issue are to be decided in the light of market conditions at the time when made. —*From our City Correspondent.*

### Ankobra River Power Co.

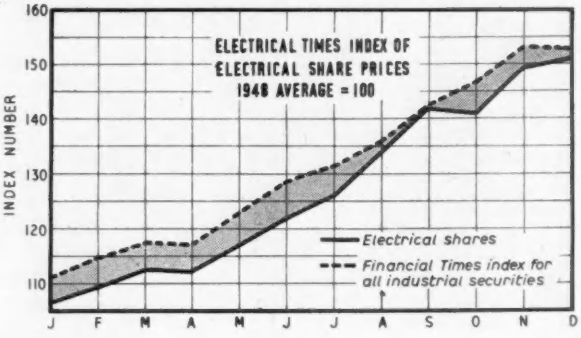
For the year ended 30 June last, the profit is £17,700 (*£10,419*) after taxation, etc. The dividend is again 5%.

### Frederick Braby and Co. Ltd.

Although sales turnover for the year ended 30 Sept. last reached a fresh peak, the trading profit dropped from £463,643 to £308,385. The final dividend has been cut to 6¼%, making a total of 8¼% for the year, compared with 15% last year. The board explains that trading profits were adversely affected by continued difficulties in connection with the new rolling mills at Glasgow, and to a lesser extent from the loss of production arising from the partial transfer from London to Crayford. The present situation at both those factories shows a very considerable improvement.

### British Electric Resistance Co. Ltd.

Improvement over last year's trading has been brought about not so much by increased output as by increased efficiency in production, and to a lesser extent to the supply and price of raw materials, Mr H. Paul-Huhne, the chairman, states. The Canadian subsidiary, also made a small profit. As to the future, although the present order book is by no means unsatisfactory, import restrictions to certain export markets are still very much with them, and it would appear that the only practical way to overcome these will be for the company to set up sub-assembly, or even manufacturing, plants abroad, he adds. The board is therefore seriously considering the establishment of a subsidiary company in Australia to serve the south-west Pacific area.




*Whilst the index for all industrial share prices fell slightly during November, that for electrical shares continued to rise. The 'Financial Times' index for industrial shares fell by 0·7 to 152·6 and the 'Electrical Times' index rose by 1·3 to 150·6.*

| Year to 31 July | £ Trading Profit | £ Net Profit | % on Ord. Earned | % on Ord. Paid | Ord. Price High | Ord. Price Low |
|---|---|---|---|---|---|---|
| 1950 | 30,560 | 10,852 | 39 | 20 | 4/4 | 3/9 |
| 1951 | 39,196 | 10,483 | 40 | 20 | 4/6 | 3/6 |
| 1952 | 51,689 | 11,252 | 43 | 25 | 3/9 | 2/6 |
| 1953 | 58,745 | 14,057 | 51 | 25* | 2/10 | 1/7 |
| 1954 | 66,514 | 15,736 | 29 | 20 | 4/6 | 2/7 |

*Plus 100% capital bonus.

### Ever Ready Trust Co. Ltd.

It is announced that £300,000 4½% Debenture Stock 1974/79 has been placed privately through Foster and Braithwaite.

### Motor and Electronics Corpn. Ltd.

Formerly known as Rothermel Corporation, Ltd., this concern announce an interim dividend of 10%, and a proposal to capitalise £48,429 and issue Ordinary shares on a one-for-three basis.

### Palestine Electric Corporation Ltd.

The directors state that acceptances of their offer to acquire the Preference and Ordinary shares of the Jerusalem Electric and Public Service Corporation Ltd. exceeded 90% of each class and accordingly their offer is binding.

### Pye Ltd.

It is proposed to raise approximately £1½m by an issue of 1m 5¼% £1 Second Preference shares to holders of all the existing classes of stock and by a rights issue to the two Deferred Ordinary classes. In announcing this, the directors refer to the need for extending the Group's activities to which end Pye Ltd., it is stated, has recently purchased the capital of a company supplying electrical control gear for industrial purposes and 60% of the capital of a company supplying an essential and widely used component for the electrical and telecommunications industries. The Board also points out that owing to the unsatisfactory state of supply of certain essential parts for the radio and television business, the demand for the company's products has been unsatisfied. It is, therefore, proposed to raise further capital and buy and equip a cabinet factory which will be in operation within three months; to finance the purchase of the capital of the cabinet-making company and the capital of a component making concern.

### Dividends Declared

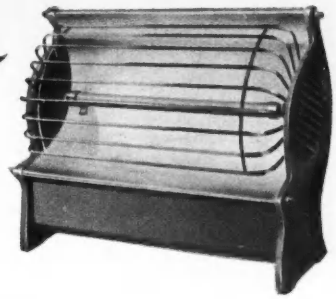
*Ada (Halifax).* Interim of 10% (*nil*).
*Aiton and Co.* Interim 7½% (*nil*).
*Belliss and Morcom Ltd.* Interim 2½% (*same*).
*Hick Hargreaves.* Interim of 5% (*same*).
*George Kent.* Interim 3% (*same*).
*Scottish Cables Ltd.* Interim of 7½% (*same*).

# Fine fires...good value...best-sellers

# MEM

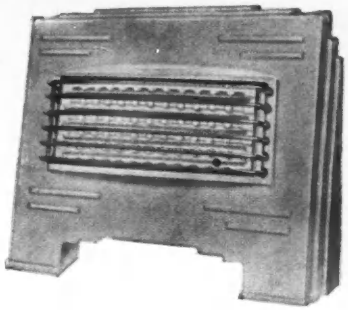
**REFLEX**

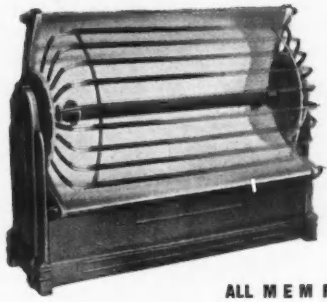
The universal stand-by, a fixed reflector fire. Goes anywhere, never out of place. 1 kW and 2 kW sizes.



**MAYFAIR**

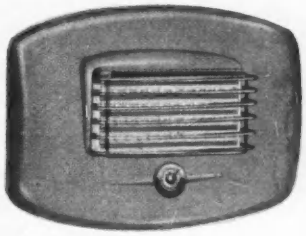
A well proportioned bar type fire of cast construction for hard wear and hard use. 1 kW and 2 kW sizes.





**MEMRAY**

A tilting reflector fire with chrome plated brass reflector. Cast construction, 1 kW and 2 kW sizes.

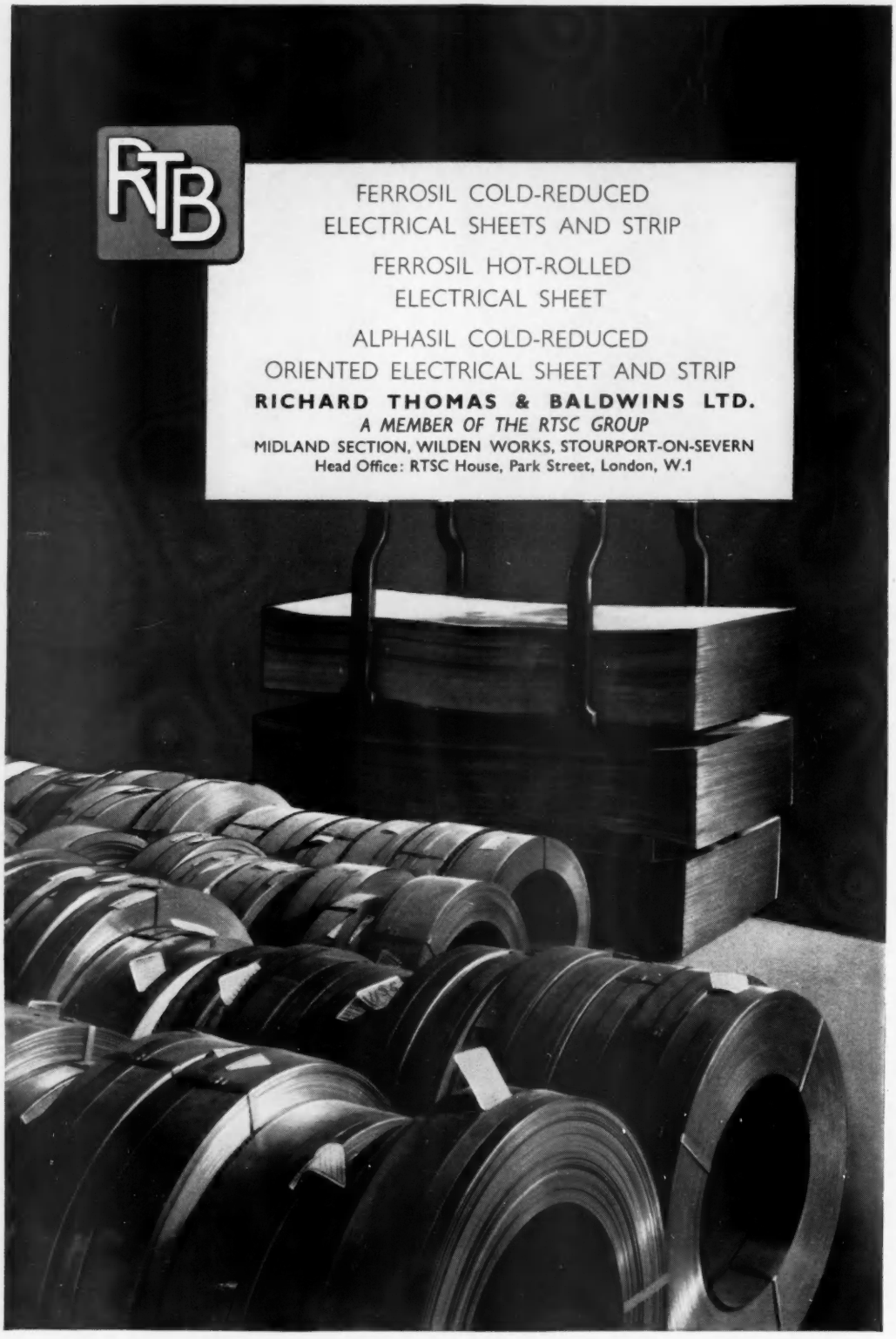


**WALBEAM**

A pleasantly shaped little fire for wall mounting —colours will blend with any decoration scheme. 1 kW and 2 kW sizes.

**ALL M E M FIRES ARE GUARDED TO COMPLY WITH STATUTORY REQUIREMENTS**

MEM **Midland Electric Manufacturing Co. Ltd., Tyseley, Birmingham, 11**


RTB
FERROSIL COLD-REDUCED
ELECTRICAL SHEETS AND STRIP
FERROSIL HOT-ROLLED
ELECTRICAL SHEET
ALPHASIL COLD-REDUCED
ORIENTED ELECTRICAL SHEET AND STRIP
RICHARD THOMAS & BALDWINS LTD.
A MEMBER OF THE RTSC GROUP
MIDLAND SECTION, WILDEN WORKS, STOURPORT-ON-SEVERN
Head Office: RTSC House, Park Street, London, W.1

# COMMERCIAL INFORMATION

## Contracts Open at Home . . .

*Dates given are the final for receipt of tenders unless otherwise stated.*

**10 Dec.—Belfast.** Radio equipment for Musgrave Park Hospital.—See 2 Dec. issue.

**10 Dec.—Durham.** Installation in hostel at Stanley.—See 2 Dec. issue.

**10 Dec.—Heston and Isleworth T.C.** Group A street lighting along Staines Rd, Hounslow.—Advertised in 25 Nov. issue.

**10 Dec.—Wicklow.** Installation at Shelton Abbey.—See 2 Dec. issue.

**11 Dec.—Dewsbury T.C.** Equipment for establishments maintained by Welfare Committee.—See 2 Dec. issue.

**11 Dec.—East Anglia.** Applications invited for inclusion in approved list of contractors.—Advertised in 2 Dec. issue.

**13 Dec.—Birmingham.** Switchgear, transformers, MV fuses switchboard, motor control gear.—See 25 Nov. issue.

**13 Dec.—Dublin T.C.** Installation in technical school in Emmet Rd, Inchicore. —See 2 Dec. issue.

**13 Dec.—Manchester T.C.** Overhead electric-driven cranes, etc., wiring, lighting, heating installation, for Davyhulme sewage works.—See 11 Nov. issue.

**13 Dec.—Worksop T.C.** Sodium lighting units on steel columns.—See 2 Dec. issue.

**13 Dec.—Wortley R.D.C.** Class B street lamps with concrete columns at Stanniington.—See 25 Nov. issue.

**14 Dec.—Bilston T.C.** Mercury discharge lamps on concrete columns in groups A, and B.—See 2 Dec. issue.

**14 Dec.—Stockport T.C.** Class B mercury vapour street lighting units, etc. —See 18 Nov. issue.

**16 Dec.—Belfast T.C.** Metering equipment.—Advertised in 25 Nov. issue.

**17 Dec.—Antrim.** Equipment for Moyle Hospital, Larne.—See 2 Dec. issue.

**17 Dec.—Rayleigh U.D.C.** Supply and erection of (*a*) 32 25 ft columns with vertical and horizontal fluorescent lighting in High St: and (*b*) of 70 25 ft columns with sodium lights along trunk road A 129. W. F. Howlett, Engineer and Surveyor, Council Offices.

**18 Dec.—Ipswich T.C.** Supply of 19 group A sodium discharge lanterns, lamps and control gear, and/or steel columns, erection and wiring along Colchester Rd. Borough Engineer and Surveyor, 19 Tower St. Deposit £1. 1s.

**18 Dec.—Mossley T.C.** Street lighting on Micklehurst estate.—See 2 Dec. issue.

**18 Dec.—Wembley T.C.** Lamps in year from 1 April.—See 25 Nov. issue.

**20 Dec.—Washington (Dur.) U.D.C.** Electrical installation in 62 houses on Coach Rd estate and 4 shops and flats in Oxford Ave. Surveyor, Council Offices.

**21 Dec.—Antrim.** Installation at Moyle Hospital, Larne.—See 2 Dec. issue.

**21 Dec.—Ashton-under-Lyne T.C.** Installation of (*a*) 66 group A units for 140 W sodium lamps along Oldham Rd, and (*b*) 16 group A 400 W mercury vapour lamps along Cavendish St. Borough Surveyor, Municipal Offices. Deposit £2. 2s.

**21 Dec.—Dublin T.C.** Installations in former Fever Hospital, Cork St.—See 2 Dec. issue.

**21 Dec.—Ilford T.C.** Installations in 119 houses.—Advertised in 2 Dec. issue.

**21 Dec.—Innerleithen T.C.** Electrical installation in 58 houses at present lit by gas. Apply to J. S. Campbell, town clerk, Municipal Bldgs, by above date.

**21 Dec.—Poole T.C.** Installation of electrical plant for Broadstone sewage works.—See 18 Nov. issue.

**23 Dec.—Co. Down.** Electrical installation in geriatric unit at Ards Hospital, Newtownards. Consulting engineer, J. McCandless, 6 Murray St, Belfast. Deposit £3. 3s.

**23 Dec.—Dorchester T.C.** Equipment for mercury discharge lighting units along trunk road A.35.—Advertised in 18 Nov. issue.

**28 Dec.—Morpeth T.C.** Group A sodium vapour lighting units on steel columns along trunk road A.1.—See 2 Dec. issue.

**29 Dec.—Radcliffe T.C.** Supply and erection 34 sodium street lighting units on concrete columns along trunk road A668. Engineer and Surveyor, Town Hall.

**30 Dec.—Belfast T.C.** Supply of analytical balance, titration bench and conductivity meter for Electricity Dept. Tender form W.59. Tenders to Town Clerk, City Hall.—Advertised in this issue.

**30 Dec.—Co. Kerry.** Boiler feed pumps, hot water accelerators and sod breaker at Mental Hospital, Killarney.—See 2 Dec. issue.

**30 Dec.—Edinburgh T.C.** Rewiring at Portobello open air swimming pool. Ramsey and Primrose, consulting engineers, 212 West Regent St, Glasgow.

**31 Dec.—Belfast T.C.** Stores requirements and condenser tubes, tube plate ferrules and packing, and coal conveying plant.—Both advertised in 2 Dec. issue.

**31 Dec.—Chippenham T.C.** Supply and erection of electrically operated pumping set at Ivyfields station. Borough Surveyor and Waterworks Engineer, 10 Market Place.

**31 Dec.—Grimsby T.C.** Installations in special school in Carnforth Crescent.—See 2 Dec. issue.

**31 Dec.—Manchester T.C.** Supply etc. of about 2,000 lineal yd of multi-core cable for automatic control purposes at Haweswater works, Westmorland. Secretary, Waterworks Offices, Town Hall. Deposit £1. 1s.—Advertised in this issue.

**31 Dec.—Manchester T.C.** Installation at Plant Hill secondary school.—Advertised in 2 Dec. issue.

**31 Dec.—Manchester T.C.** Supply, jointing, etc., of about 2,000 lineal yd multicore cable for automatic control purposes at Hawes water works, Westmorland. Secretary, Waterworks Offices, Town Hall. Deposit £1. 1s.

**31 Dec.—Wandsworth B.C.** Lamps in year from 1 Apr., and electrical works for three years.—See 25 Nov. issue.

**3 Jan.—Chertsey U.D.C.** Installation of group A mercury vapour street lighting along about 2,400 yd of Eastworth and Chertsey Rds. Engineer and Surveyor, Council Offices, Guildford St. Deposit £1. 1s.

**3 Jan.—Richmond (Yorks) R.D.C.** Ejector plant and pumping plant for Gilling and Aldborough sewerage.—See 2 Dec. issue.

**5 Jan.—Macclesfield T.C.** Supply and erection of 8 group A sodium lighting units on concrete columns, and supply of 18 group B units and columns. J. H. Dossett, Borough Engineer, Town Hall. Deposit £2. 2s.—Advertised in this issue.

**6 Jan.—Belfast T.C.** Extensions to low pressure piping installations at Power Station West. — Advertised in 25 Nov. issue.

**7 Jan.—Sheffield T.C.** Installations at colleges of technology and commerce in Pond St.—See 25 Nov. issue.

**8 Jan.—Dagenham T.C.** Supplies required in year from 1 Apr. include electric lamps, cables, conduit and accessories. Borough Engineer and Surveyor, Civic Centre.

**8 Jan.—Ruislip - Northwood U.D.C.** Lamps in year from 1 Apr.—See 2 Dec. issue.

## Your Queries Answered

*Readers are invited to make use of our free enquiry department which possesses wide resources including an index of trade information with over 100,000 entries*

***A Selection from the 123 queries answered this week***

**"Roblec" irons,** makers of? S.W.B.—Robson Electrical Products Ltd., Union St, West Bromwich, Staffs.

**Shaver marked M.M. Co., Chicago,** agents for? W.D.—Millard Bros. Ltd., 467 Caledonian Rd, N.7.

**Flexib'e tubu'ar shop window de-misters,** maker of? H.G.—Whitmarley Displays Ltd., Knutsford St, Birmingham.

**"Cimex" floor - scrubbing machine,** makers of? M.A.—Cimex Fraser Tuson Ltd., Cray Ave, Orpington, Kent.

**"Rob Roy" irons,** address for? S.W.B. —Scottish Precision Eng. Co., 27 Cadogan St, Glasgow, C.2.

**Electric paint strippers,** makers of? T.E. —Skarsten Mfg. Co., Ltd., 21 Hyde Way, Welwyn Gdn City, Herts; Osborn Mfg. Co., Ltd., 5/13 Highgate Sq, Birmingham 12; Maurice Cheshire Co., 29 Soho Hill, Birmingham 19; Baronet Electrical Developments, 20 Regent Rd, Harborne, Birmingham 17.

**10 Jan.—West Riding.** Rewiring in Harrogate Technical school and school of art. County Architect, "Bishopgarth," Westfield Rd, Wakefield. Deposit £2, 2s. —Advertised in this issue.

**12 Jan.—Dublin.** Supply and erection of three electric goods lifts of 3-ton capacity for Port and Docks Board. Board Engineer's office, East Wall St. Deposit £10.

**12 Jan.—Dublin.** Three overhead travelling electric gantry cranes.—See 2 Dec. issue.

**17 Jan.—Exeter T.C.** Supply of a vertical spindle electric pump of 84,000 g.p.h. capacity at Countess Wear sewage works. City Engineer and Surveyor, 7 Southernhay West.

**21 Jan.—Dundalk U.D.C.** Two pumping units with accessories for water supply augmentation scheme.—See 2 Dec. issue.

**24 Jan.—Newcastle-on-Tyne.** Electric cargo-grabbing cranes at Albert Edward Dock.—See 2 Dec. issue.

**No date stated—Crawley (Sussex) P.C.** Supply of 18 25 ft concrete columns and fluorescent lanterns. Clerk, Robinson Hse, Robinson Rd.

**No date stated—Fifeshire.** Electrical installation in proposed primary school at Mountfleurie, Leven. Surveyors, James Gentles and Son, Osborne Hse, Kirkcaldy.

**No date stated.—Romford T.C.** Lamps included in annual tenders invited for materials. Borough Engineer, Town Hall.

**No date stated.—N. of Scotland H.E. Board.** Provision of outdoor 132 kV switchgear and ancillary equipment for Clunie substation. Kennedy and Donkin, 12 Caxton St, London, S.W.1. Deposit £2, 2s.—Advertised in this issue.

## . . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon House, Theobalds Rd, W.C.1, quoting reference.*

**30 Dec.—New Zealand.** Supply of 20 main line diesel electric locomotives to N.Z. Govt. Railways. Reference No.: C/F 99/704. Specifications from High Commissioner for N.Z., 415 Strand, London, W.C.2.

**31 Dec.—India.** Supply of two 78 kV 25/50-cy 600 A oil circuit-breakers for Shinshapura power station. Stores Purchase Committee, Asiatic Buildings, Kempegowda Rd, Govt. of Mysore, Bangalore City. B.o.T. (Ref.: ESB 28058/54).*

**5 Jan.—Spain.** Supply of $213,600 worth of steel goods and insulators for h.t. lines for Iberduero. Direccion General de Cooperacion Economica, Madrid.

**10 Jan.—Costa Rica.** Instituto Costarricense De Electricidad San Jose, require main equipment and auxiliaries to equip diesel electric plant of 10 to 15 MW on basis of complete diesel generator units with power of between 1,250 kW and 3,000 kW each with limited angular velocities between 225 and 600 r.p.m. Tender No. 145. B.o.T. (Ref.: 27999/54).*

**10 Jan.—Philippines.** Supply of power transformers, switchgear, appurtenances, accessories and spares for San Fernando substation, Agno River No. 1 Hydroelectric project. National Power Corporation, Bonifacio Drive, Port Area, Manila. Deposit, ten pesos. B.o.T. (Ref.: ESB 27981/54).*

**14 Jan.—South Africa.** City of Durban invite tenders for (*a*) two 2,500 kVA 3-phase automatic on-load tap changing transformers; and (*b*) total of 74 3-phase transformers between 50 kVA and 1,000 kVA. Tender Nos. E.2539 and 2538 resp. Separate contracts. Town Clerk, Municipal Bldgs, West St. B.o.T. (Refs.: ESB 27545/54 and 27544/54 resp.)*

**17 Jan.—India.** Supply and erection of cooling towers and auxiliary apparatus for extension to Madras Basin Bridge B power station. Specification No. C.533. Superintending Engineer, Technical (Civil), 157 Mount Rd, Madras.

**19 Jan.—New Zealand.** Tenders (P. and T. 150/7100) invited for total of 250 capacitors to various specifications. Post and Telegraph Dept., Wellington. B.o.T. Ref.: ESB 27778/54).*

**27 Jan.—Australia.** Supply of three 66 kV circuit-breakers and one potential transformer for State Electricity Commission of Western Australia, Perth. Specification No. 15/BUN. B.o.T. (Ref.: ESB 27972/54).*

**27 Jan.—New Zealand.** Supply of 55½ miles of various types of telephone cable, textile covered and sheathed in pure lead or lead alloy. Stores Div., G.P.O., Windsor Building, 4 Willis St, Wellington.

**28 Jan.—New Zealand.** Post and Telegraph Dept., Wellington, invites tenders (P. and T. 150/7556) for supply of 16,000 ft twin-twisted cable, 3/·029 TRS or TPS 660 V grade. B.o.T. (Ref.: ESB 27777/54).*

**1 Feb.—Egypt.** Tenders invited for supply of 63 kV underground cable system and associated switching stations including cables, switchgear, circuit-breakers, lighting, etc. Cairo Electricity and Gas Administration, 53 Sharia 23 Yulin, Cairo. B.o.T. (Ref.: ESB 27158/54).*

**1 Feb.—Iraq.** Supply of air conditioning plant, electrical, boiler and lift equipment for Houses of Parliament, Baghdad. Documents may be had from either the architect, Mr J. Brian Cooper, 177 Corporation St, Birmingham, or consulting engineers, J. Roger Preston and Partner, 15 North Audley St, London W.1.

**1 Feb.—New Zealand.** Boiler plant required for N. Canterbury Hospital Board. B.o.T. (Ref.: ESB 16831/54).*

**12 Feb.—Thailand.** Supply and erection of two 5,000 kW generating units with lignite fuel fired boilers and all ancillary equipment at Mae Moh, Lampang. Also supply, erection of 69 kV switchyard at same. Separate Contracts. Lignite Thermal Power Organisation, Royal Irrigation Dept., Samsen Rd, Bangkok. Documents No. LTPO/1/10/54. B.o.T. (Ref.: ESB 27976/54 and 27975/54 respectively).*

**21 Apr.—Australia.** Southern Electric Authority of Queensland, Boundary St, Brisbane, invite tenders (No. 54/19) for two steam boilers and accessories, also automatic control instruments for Bulimba B power station. B.o.T. (Ref.: ESB 27737/54).*

## PRICES of cable metals and other materials

***Figures quoted are the official prices ruling on Tuesday, 7 December***

| | £ per ton | Weekly change £ | Price last year £ |
|---|---|---|---|
| COPPER, standard class A (settlement) | 281 | +15½ | 234½ |
| „ (3 months) | 265 | +8 | 224½ |
| LEAD, refined pig, min. 99·97% purity (cash) | 104 | +⅜ | 91 |
| „ (3 months) | 103⅜ | +1 | 89 |
| TIN, refined, min. 99·75% purity (settlement) | 716 | −1½ | 670 |
| „ (3 months) | 714 | −1 | 647½ |
| ALUMINIUM, ingots 99·99·5% | 156 | — | 150 |
| ZINC, virgin, min. 98% purity (cash) | 82½ | +1⅛ | 74 |
| „ (3 months) | 82 | +1⅛ | 74 |
| RUBBER No. 1, RSS. spot (per lb.) | 24⅛d. | −⅛d. | 18d. |
| „ c.i.f. basis, ports. Feb. (per lb.) | 24d. | +⅛d. | 17⅛d. |
| ARMOURING: | | | |
| Galv. Steel Wire (0·104 in.) | 52½ | — | 51½ |
| Mild Steel Tape (0·014 in.) | 40½ | — | 40 |

## Contracts Placed

**B.E.A.** 11 kV and lower voltage cables at Marchwood, London Electricity Board; Auxiliary power control and instrument cables at Castle Donington, British Insulated Callender's Cables Ltd.; Circulating water tunnel and outfall at Nottingham, Marples, Ridgway and Partners Ltd.; Two 75 MVA 8/10·8 kV generator transformers at Rogerstone; C. A. Parsons and Co., Ltd.; 132 kV, 2,500 MVA switchgear at Bedford substation, A. Reyrolle and Co., Ltd.; 132 kV, 2,500 MVA switchgear at E. Yelland substation, British Thomson-Houston Co., Ltd.; 45 MVA 132/66 kV transformers at Margam substation, General Electric Co., Ltd.; 132 kV, 2,500 MVA switchgear at Tir John and Ystradgynlais substation, Metropolitan-Vickers Electrical Co., Ltd.; 275 kV and 132 kV overhead lines between Monk Fryston and Ferrybridge B, Balfour Beatty and Co., Ltd.; and 132 kV overhead lines from Redhouse to Cupar, W. T. Henley's Co., Ltd.

**Darlington T.C.** Installation in additions to Greenbank Hospital, Falconer Cross and Co., Ltd. £3,537.

**London.** Supply, etc., of filtered water centrifugal pump, a 650 kW d.c. generator for Metropolitan Water Board's Hampton works, W. H. Allen Sons and Co. Ltd., £20,988.

**Oulton (Suffolk).** Electrical work in stage 2 of adaptations to Lothingland Hospital, Mann, Egerton and Co., Ltd., £9,586.

**Sheffield.** Electrical installation at Rotherwood Sidings for B.R., S. H. Haywood and Co., Ltd.

**Southgate T.C.** Alterations to wiring in 180 houses at Northern estate, Eastern Electricity Board, £2,205.

## TRADE MARKS

*This information is extracted from the Official Journal by permission of the Controller.*

**Viscount.** 734,087. Class 9. Radio receiving and transmitting apparatus, etc. R. N. Fitton Ltd., Princess Works, Princess St, Brighouse, Yorks.

**Dryomatic.** 733,816. Class 11. Drying apparatus for domestic purposes. Dishmaster (London) Ltd., 151 Gt. Portland St, W.1.

**Emitex.** 733,050. Class 16. Impregnated paper. Electric and Musical Industries Ltd., Blyth Rd, Hayes, Middx.

**"Batlife."** 726,672. Class 1. Chemical substances for use in electric batteries. R. J. Beasant, Challow Marsh Farm, Wantage, Berks.

# BUSINESS PROSPECTS

## Home

**Acton (Middx.).** Tenders to be invited for erection of an instalment of The Elms secondary modern school, estimated to cost £132,620.

**Ashton-under-Lyne.** Manchester Hospital Board has approved scheme for renewal of electrical installation at General Hospital.

**Bath.** Cost of extensions to premises for J. Colmar Ltd., Union St, estimated at £60,000. Architect is H. D. Roberts, 7 Brock St.

**Belford (Northumberland) R.D.C.** Five blocks of flats to be built on site of former hostel.

**Blackpool.** Plans submitted by Eclipse Printing Co. of Queens St for works.

**Blairgowrie (Perth).** Smedley's Ltd. propose to build new factory for which Lowe and Barrie, 65 Nethergate, Dundee, are architects.

**Billingham (Dur.) U.D.C.** Scheme approved for erection of 272 houses on Roseberry Rd site.

**Blyth T.C.** Provisional allocation for 1955 is 26 houses.

**Boldon U.D.C.** Layout plans to be prepared for about 80 houses at West Boldon. A similar number proposed at Whitburn.

**Boston.** Permission sought by Holland C.C. to build first instalment of new county offices in London Rd.

**Bournemouth.** F. Barber and Son, Ltd., 44 Denmark Rd, Winton, to build factory in Wallisdown Rd. Plans submitted.

**Brighton T.C.** Erection of secondary grammar school at Stanmer. Borough Engineer and Surveyor, 26-30 Kings Rd.

**Camberwell.** Scheme approved for county secondary school at Red Post Hill, Dulwich. Cost estimated at £430,330.

**Cavan (Eire) U.D.C.** Construction of 50 houses at Swellan. F. Gibrey, architect and town planning consultant, 29 Merrion Sq, Dublin.

**Chingford T.C.** Erection of 28 houses on Tower estate, Epping. Borough Engineer, Town Hall, E.4.

**Coventry T.C.** Further instalment of new building at City of Coventry Training College has been included in 1955-56 programme. Cost estimated at £265,270.

**Croydon.** New factory to be erected at Addington for S. Warner and Sons Ltd., 427 Brighton Rd, South Croydon.

**Derby T.C.** Plans in hand for erection of 100 houses on Breadsall estate.

**Durham.** Peterlee Development Corpn. to build 22 new shops. Work to begin early next year.

**Falkirk.** Provisional approval received from T.C. for erection of coach building factory in Grangemouth Rd by W. Alexander and Co. (Coachbuilders) Ltd., Drip Rd.

**Gosport U.D.C.** It is proposed to build houses on 152 acres of land at Fawdon.

**Halifax T.C.** Construction of 22 aged persons' bungalows at Illingworth, 16 at Pellon, 18 at Siddal and 32 at Ovenden. Borough Engineer, Crossley St.

**Hastings.** Knightshades Ltd. have acquired site at Ponswood for erection of factory.

**Houghton-le-Spring U.D.C.** Scheme being considered for modernisation of over 2,000 old houses, including installation of extra power points.

**Huddersfield.** New fire station to be built near Manchester St bus station at cost of about £100,000.

**Huntingdon T.C.** Further 40 houses to be built on American Lane site.

**Jarrow-on-Tyne T.C.** Scheme approved for erection of 86 houses on South Leam Lane estate. Allocation for 1955 is 200 houses.

**Kensington.** Plans for R.C. secondary school for girls in Sir Charles Sq have been prepared by Nicholas and Dixon-Spain, architects, 19 Hanover Sq, W.1. Estimated cost £152,550.

**Kesteven.** County Council to build new secondary modern school at Grantham and also extend Kesteven and Grantham girls' school. Costs estimated at £140,250 and £50,482 respectively.

**Kidderminster.** Plans approved for factory extensions in Birmingham Rd. proposed by W. and R. R. Adam Ltd.

**Lancashire.** H. J. Heinz Co., Ltd., have acquired site at Kitt Green for food factory. Cost estimated at £2½ million including equipment.

**Lewisham.** Tenders to be invited soon for rebuilding Northbrook secondary school. Architects are Covell and Matthews, 48 Seymour St, Portman Sq, W.1. Cost estimated at £105,439.

**Longbenton.** Research laboratories, offices, canteen etc. planned by Thomas Hedley and Co., Ltd. Cost of buildings estimated at £350,000.

**Middlesbrough.** Middleton and Co., of Boundary Rd, to build factory and offices in Cannon St. Thompson's Enterprises Ltd., Palladium Buildings, are to complete construction of cinema in Longlands Rd. Project was postponed at outbreak of war.

**Morecambe.** Plans submitted by G. C. Raymond and Co. Ltd., for new factory at Westgate.

**Newcastle-on-Tyne T.C.** Erection of North Kenton county primary school. City Architect, 18 Cloth Market.

**Newcastle-on-Tyne.** Architects for proposed 3-storey parking garage in Fengle St, for Smarts (Newcastle) Ltd., are W. B. Edwards and Partners, Eldon Place.

**Peterborough R.D.C.** 46 houses to be built in Back Lane, Eye.

**Ruislip-Northwood (Middx.).** Tenders may soon be invited for erection of Joel St secondary grammar school for girls. Estimated cost, £172,890.

**Tottenham B.C.** Quotations being sought for installation of new electrical equipment at Central Baths. That and removal of existing plant will cost about £2,000.

**Twickenham (Middx.).** Tenders may be invited shortly for erection of an instalment of Whitton secondary modern school. Cost estimated at £183,790.

## Overseas

**Venezuela.** Senor Juan Heimann of Distribuidora Man, Apartado 2499, Caracas, are interested in representing U.K. manufacturers of electric sewing machine motors (110 V 60 c/s).

# TRADE NOTES

**Changes of Address.** The Rectifier Division of Standard Telephones and Cables Ltd. will be moved from Warwick Rd, Boreham Wood, Herts, to a new factory at Edinburgh Way, Harlow, Essex (Telephone: Harlow 26811). The transfer is scheduled to take place on 15 Dec.

Smiths English Clocks Ltd. have moved their Scottish depot from 153 Boswell St, Glasgow, to 123/145 North St, Glasgow C.3. Telephone: Glasgow-Central 3972/8.

Mr W. Maitland, area engineer for Wilkinson Rubber Linatex Ltd., has changed his address to 66 Woodbank Crescent, Clarkston, Glasgow.

Mr F. E. London, representative for Venner Ltd. in the North Eastern Electricity Board Area, is now resident at 10 Grosvenor Terrace, Bootham, York (Telephone: York 3569).

**Change of name.** The name of Tiltman Langley Laboratories Ltd. has been changed to Tiltman Langley Ltd.

**New Branches.** The Telegraph Construction and Maintenance Co., Ltd., have opened three new branches at Birmingham; the address is Gloucester House, 270 Corporation St, Birmingham (Telephone: Birmingham, Central 6191); at Nottingham, Potters Buildings, Warser Gate (Telephone: Nottingham 44559), and at Cardiff, 16/17 Hills Terrace (Telephone: Cardiff 27467). The managers are noted on page 860.

# Gazette Announcements

COMPANIES ACTS

**Taynor Machines Ltd.** Meeting of members will take place at Clifton Hse, Euston Rd, London N.W.1, on 30 Dec. at 11 a.m. to receive liquidator's report.

**Atozed (London) Ltd.** Meeting of members and creditors will be held at office of Jackson, Pixley and Co., Kent Hse, Telegraph St, London E.C.2, on 15 Dec. at 12.30 p.m. to receive report of liquidator.

**Smith and Russell (Coseley) Ltd.** Last day for receiving proofs in respect of intended dividends. 18 Dec. Liquidator is R. K. Clark, Official Receiver, Somerset Hse, Temple St, Birmingham.

**Coldstor Ltd.** Winding-up order made on 29 Nov., Petition presented on 16 Nov.

**White Cooking Equipment Ltd.** Liquidator, B. Phillips of 76 New Cavendish St, London, W.1, released as from 1 Sept.

*Winding-Up.*

**University Camera and Radio Co., Ltd.** No resolution passed at the first meeting and matter was left in hands of Official Receiver as liquidator. Statement of affairs had not been filed but liabilities estimated at about £100, excluding any money due to Mr Mark Berson, sole director throughout, on current account. Mr Berson had intimated he did not intend to make any claim. Assets had been valued at few pounds only.

BANKRUPTCY ACTS

*Release of Trustee.*

**Middlesbrough.** John G. Milne, radio and electrical dealer trading at 34 Whitworth Rd, Grangetown. Trustee was C. G. Sparrow, C.A., 62 High St, Stockton-on-Tees.

*Dividends.*

**Ipswich.** Jack Cooper, mechanical and electrical engineer trading at Market Place, Orford. Supplemental dividends of 3s. 9d. in £ payable at Official Receiver's Office, 3 and 5 Northgate St, Ipswich.

# MEETINGS TO NOTE

**THURSDAY, 9 DEC.**

I.E.E. (London Utilisation). "Brushless Variable-Speed Induction Motor," Prof. F. C. William and E. R. Laithwaite. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (N. Scotland). "Determination of Static and Dynamic Properties of Resilient Materials," R. S. Jackson, A. J. King and C. R. Maguire. University College, Dundee, 7 p.m.

I.E.E. (Swansea). "Royal Festival Hall, Electrical Installation," J. G. Hunter. Elect. Offices, The Kingsway, 6 p.m.

I.E.E. (Bristol Students). Students' lecture on "Attitudes of the Mind," A. R. Cooper. Elect. Offices, Colston Ave, Bristol.

DERBY ELECTRICAL SOC. "Radio Isotopes in Industry," J. L. Putman. Elect. Showrooms, Irongate, 7 p.m.

I.E.S. (Manchester). "Studies in Interior Lighting," J. M. Waldram. Elect. Offices, Town Hall, 6 p.m.

**FRIDAY, 10 DEC.**

INCORP. PLANT ENGRS. (Yorks). Film Show. Great Northern Hotel, Leeds, 7.30 p.m.

I.E.E. (Rugby). Faraday lecture on "Courier to Carrier in Communications," T. B. D. Terroni. Temple Speech Room, 7 p.m.

E.P.E.A. (Southern Meter Engrs.). "Ripplay Control, Tool for the Power Engineer," L. H. Yardley. Caxton Hall, Westminster, S.W.1, 6.30 p.m.

LEICESTER ELECTRICAL SOC. Christmas party at Corn Exchange.

A.S.E.E. (N.W. London). "Manufacture of a.c. Induction Motors," R. T. Sutton. Century Hotel, Forty Ave, Wembley Park, 8.15 p.m.

**MONDAY, 13 DEC.**

INCORP. PLANT ENGRS. (Dundee). "Feedwater Treatment," E. L. Streatfield. Mathers Hotel, 7.30 p.m.

INST. OF FUEL (N. Eastern). "Experience with Spreader Stokers," T. H. Lindsay and P. Pilkington. King's College, Newcastle, 6.30 p.m.

I.E.E. (London Radio). Discussion on "Problems in Maintenance of Domestic TV Receivers," W. L. Greenwood. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (Mersey and N. Wales). "Safety in Use of Portable and Transportable Electrical Equipment in Industry," J. W. Bunting. Town Hall, Chester, 6.30 p.m.

I.E.E. (N. Eastern). "Short-Circuit Forces on Turbo-Alternator End Windings," J. B. Young and D. H. Tompsett. Neville Hall, Westgate Rd, Newcastle, 6.15 p.m.

I.E.E. (N. Staffs). "Aluminium-Sheathed Cables," P. M. Hollingsworth and P. A. Raine. Duncan Hall, Stone, 7 p.m.

I.E.E. (Western). "Possibilities of Cross-Channel Power Link between British and French Supply Systems," D. P. Sayers, M. E. Laborde, and F. J. Lane. Elect. Offices, Colston Ave, Bristol, 6 p.m.

IPSWICH ELECTRICAL ASSOC. Film night at Electric Hse, 7.30 p.m.

BIRMINGHAM ELECTRIC CLUB. "B.R.M. and Racing Car Design," P. Berthon.

LEICESTER ELECTRICAL SOC. "Safe Use of Portable Apparatus," S. J. Emerson; "Precautions in Radio and TV Test Depts.," A. S. Carr. Elect. Offices, Charles St, 7 p.m.

I.E.S. (Leeds). "X-Ray Apparatus for Medical Applications," F. L. Veale. Lighting Service Bureau, 24 Aire St, 6.15 p.m.

I.E.S. (Sheffield). Presidential address by E. C. Lennox. University, Western Bank, 6.30 p.m.

A.S.E.E. (Central London). "Atomic Energy," R. A. Dixon, St. Ermin's Hotel, Caxton St, S.W.1, 7 p.m.

**TUESDAY, 14 DEC.**

ELECT. INDUSTRIES CLUB. Christmas luncheon at Connaught Rooms. Speaker: Tom Fallon.

INCORP. PLANT ENGRS. (Manchester). "Fire Protection in Peace and War," K. N. Hoare. Engineers' Club, Albert Sq, 7.15 p.m.

INCORP. PLANT ENGRS. (S. Wales). "Vacuum and Air in Industry," Mackworth St, Swansea, 7.15 p.m.

I.E.E. (London Measurements). "An Attracted-Disc Absolute Voltmeter," G. W. Bowdler; "Use of Electron Velocity Analyser to Stabilize 50 kV d.c. Voltage Source to a Few Parts in a Million," M. E. Haine and M. W. Jervis; "Precision d.c. Stabiliser," M. W. Jervis. Savoy Place, 5.30 p.m.

I.E.E. (N. Midland). Discussion on "Place of Electrical Network Theory in Electrical Courses," G. S. Brayshaw. Elect Offices, 1 Whitehall Rd, Leeds, 6.30 p.m.

I.E.E. (N. Ireland). "Possibilities of Cross-Channel Power Link between British and French Supply Systems," D. P. Sayers, M. E. Laborde and F. J. Lane. Queen's University, Belfast, 6.30 p.m.

COVENTRY ELECTRIC CLUB. Electrical Quiz at Electric Sports and Social Club, Merrick Lodge, St. Nicholas St.

I.E.S. (Liverpool). "Stage Lighting," P. Corry. College of Arts, Hope St, 7 p.m.

A.S.E.E. (Manchester). "Electrical Generation by Wind Power," Lord Verulam, Engineers' Club, Albert Sq, 7 p.m.

**WEDNESDAY, 15 DEC.**

INCORP. PLANT ENGRS. (Glasgow). "Steam for Process," L. G. Northcroft. Building Centre, Sauchiehall St, 7 p.m.

INCORP. PLANT ENGRS. (Kent). "Steam-main Design and Modern Development in Field of Gamma-ray Examination of Pressure Welds," E. Marson and H. Webborn. Bull Hotel, Rochester, 7 p.m.

I.E.E. (London Supply). "Short-Circuit Forces on Turbo-Alternator End Windings," J. B. Young and D. H. Tompsett. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (Sheffield). "Design Features of Semi-Outdoor Power Station at Ince," F. H. S. Brown. Grand Hotel, 6.30 p.m.

I.E.E. (S.W. Scotland). "Servo Machines," W. S. Wood. 39 Elmbank Cresc, Glasgow, 7 p.m.

I.E.E. (London Students). "Machine, Animals and Information," B. Z. de Ferranti. Public Library, Chelmsford, 7 p.m.

A.S.E.E. (Nottingham). American Industrial Films. Elect. Showrooms, Smithy Row, 7.30 p.m.

A.S.E.E. (Southampton). "Sound Recording on Disc and on Magnetic Tape," J. F. Doust, Polygon Hotel, 8.15 p.m.

A.S.E.E. (S.W. London). "Modern Lighting Technique," R. Pye, Guild Hse, 32 Worple Rd, Wimbledon, 8.15 p.m.

**THURSDAY, 16 DEC.**

INCORP. PLANT ENGRS. (Blackburn). "Lighting," Mr Robinson of E.D.A. Golden Lion Hotel, 7.30 p.m.

INCORP. PLANT ENGRS. (Mersey and N. Wales). "Progress in Lamps and Lighting," R. V. Mills. Radiant Hse, Bold St, Liverpool, 7.15 p.m.

I.E.E. (E. Midland). Faraday lecture on "Courier to Carrier in Communications," T. B. D. Terroni. Albert Hall, Nottingham, 6.30 p.m.

I.E.E. (Southern). Annual dinner and dance at Polygon Hotel, Southampton.

I.E.E. (Irish). "New Cork Power Station—Mechanical and Electrical Plant," H. Monroe and C. V. O'Donnell. Trinity College, Dublin, 6 p.m.

CHELMSFORD ENGRNG. SOC. "Contribution of Twentieth Century Science to Modern Thought," Sir Henry Self. Social Hall of Crompton's, 7.30 p.m.

A.S.E.E. (Watford). "Industrial, Electrical and Mechanical Repairs," H. Westwood, Clarendon Hotel, Station Rd, 8 p.m.

**FRIDAY, 17 DEC.**

INCORP. PLANT ENGRS. (Birmingham). Film show. Imperial Hotel, 7.30 p.m.

INCORP. PLANT ENGRS. (North-East). Annual dinner.

ELECT. TRADES' COMMERCIAL TRAVELLERS' ASSOC. Annual stag party, dinner and smoker. The Windsor Castle (Victoria Stn), S.W.1, 6.30 p.m.

INST. OF PHYSICS. "X-Ray Fluorescence Analysis," E. F. Priestley, 47 Belgrave Sq, S.W.1, 6.30 p.m.

**SATURDAY, 18 DEC.**

MANCHESTER ASSOC. OF ENGRS. Christmas Conversazione and Dance at College of Technology.

A.S.E.E. (Oxford). "Earth Leakage Protection," J. A. Robbins, Y.M.C.A., 10 George St, 6.30 p.m.

# NEW COMPANIES

*Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, W.C.2.*

**Aveley Electric Ltd.,** 44 Tottenham Court Rd, W.1. Designers and developers, manufacturers of and dealers in radio, radar, telecommunications, electronic apparatus, etc. Nom. cap.: £10,000. Dirs.: J. I. Brown, Ruby F. Parker and A. C. Judd.

**British Refrasil Co. Ltd.** Manufacturers of and dealers in materials affording insulation or protection from or for heat, cold, light, electricity, sound, blows; mechanical, consulting, civil and general engineers, etc. Nom. cap.: £50,000. Dirs.: to be appointed by subs. Subs.: J. Hughes, 95 Eastern Ave, East Romford, Essex; and D. R. Walker, 155 Cromwell Rd, S.W.5.

**Hendry and Hawkins Ltd.,** 7 St Albans Rd, Hatfield. Consulting, experimental, mechanical, electrical and general engineers, needle and pin makers, etc. Nom. cap.: £10,000. Permt. dirs.: R. R. Henry and L. A. Hawkins.

**J. A. N. Wentworth Ltd.** Electronic specialists, etc. Nom. cap.: £500. Dirs.: to be appointed by subs. Subs.: J. A. N. Wentworth, 80 St Laurence Ave, Worthing, and J. P. Hawkes, 43 South Farm Rd, Worthing.

**Victor Buckland Service Ltd.,** 37/39 London Rd, Derby. To take over business of radio and electrical repairers, being part of the business carried on by Victor Buckland, Ltd., at London Rd, Derby. Nom. cap.: £1,250. Dirs.: V. Buckland and B. Tailby.

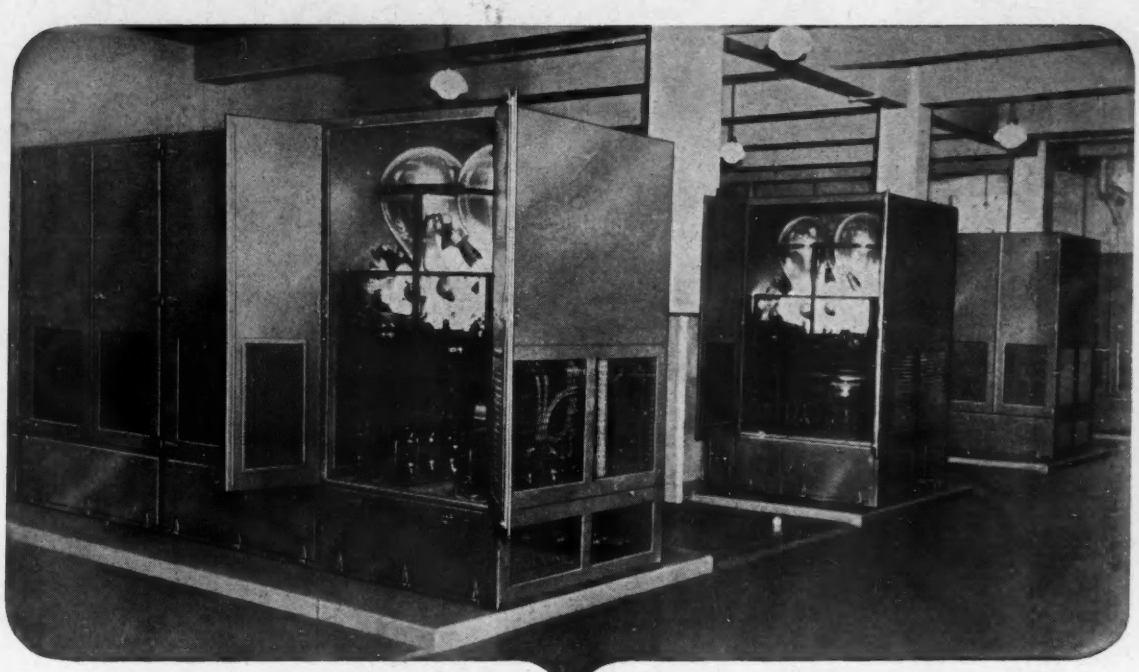
**Malpas Electrical Services Ltd.** Old Market Hse, Church St, Malpas, Ches. Nom. cap.: £300. Dirs.: S. B. Rook and Gladys A. Rook.

**Electric Windings (London) Ltd.** 2a Whites Row, E.1. Nom. cap.: £500. Dirs: S. Ellenberg and D. E. Barker.

**Punch Pumps Ltd.** The Wells, Quakers Walk, Bush Hill, N.21. Mechanical pump and mechanical, electrical and general engineers, etc. Nom. cap.: £100. Dirs.: G. L. Crook and Mrs. M. F. Crook.

**H. Faulkner and Co., Ltd.,** 7 Hunters Lane, Rochdale. Manufacturers and distributors of electrical and mechanical lighters, etc. Nom. cap.: £2,000. Dirs.: H. Faulkner, H. W. B. Fish, and F. Hobson.

**Watt Bros. (Electrical) Ltd.** 123 Pall Mall, S.W.1. Manufacturers and distributors of and dealers in electrical goods, wireless and television sets, etc. Nom. cap.: £100. Dirs.: J. Hyams, R. M. Watt, and S. Hall.



# Hewittic Rectifiers

## PUMPLESS — AIR COOLED — UP TO ANY CAPACITY

*Simple and reliable, robust, compact; backed by nearly 50 years' experience, Hewittic Rectifiers have proved to be the ideal converting plant for the operation of electric railway, tramway and trolleybus systems down to battery charging. Send for further details.*

## OVER 1¼ MILLION KW. IN WORLD WIDE SERVICE

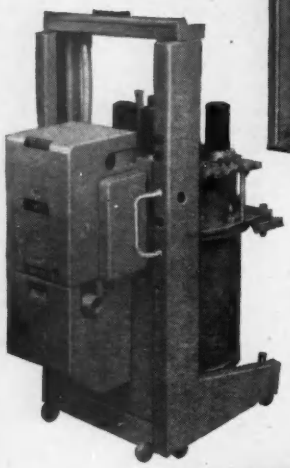
*The illustration shows Hewittic Rectifiers in traction service in Canada (British Columbia Electric Co.). Each bank has a capacity of 1,500 kW. with high overload rating for heavy traction service. The total capacity of Hewittic Rectifiers on this system is approximately 30,000 kW.*

HACKBRIDGE AND HEWITTIC ELECTRIC CO., LIMITED
WALTON-ON-THAMES - SURREY - ENGLAND
*Telephone : Walton-on-Thames 760 (8 lines)* *Telegrams : "Electric, Walton-on-Thames"*

R.5

# H.V. Metal-Enclosed SWITCHGEAR

## 150 MVA at 3·3 kV
## 250 MVA at 6·6 & 11 kV



Type V1H, air-insulated. Type V2H, compound filled. Available for ratings of 400, 800 and 1,200 amps.

*Please write for further information.*

These three illustrations show the clean design. Cubicle doors open to allow breakers to be pulled forward on their trucks but, in addition, they can be readily removed from their hinges to give full access to the interior without obstructing the space in front of the switchboard.

METROPOLITAN-VICKERS
ELECTRICAL CO LTD · TRAFFORD PARK · MANCHESTER, 17

*Member of the A.E.I. group of companies*

*Leading Electrical Progress*

F/A401

# CLASSIFIED ADVERTISEMENTS

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 32s. 6d. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

## TENDERS INVITED

### CITY AND COUNTY BOROUGH OF BELFAST
**Electricity Department**

ELECTRICITY (ESSENTIAL SUPPLIES) ACT (NORTHERN IRELAND) 1954

TENDERS are invited for the Supply and Delivery of:
ANALYTICAL BALANCE, TITRATION BENCH AND CONDUCTIVITY METER

Specification (No. W.59) and Form of Tender may be obtained at the Electricity Department, East Bridge St, Belfast.

Each tender in sealed envelope marked "Tender for Analytical Balance, etc., Electricity Department" and endorsed with the name and address of the tenderer, must be addressed to the Town Clerk, City Hall, Belfast, so as to reach him not later than 4 p.m. on Thursday, 30 Dec., 1954.

An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered.

The lowest or any tender will not necessarily be accepted.

EYRE GORDON,
Chairman.
Northern Ireland Joint Electricity Committee.

Chichester House,
Chichester St, Belfast.
30 Nov., 1954. (P 160)

### MANCHESTER CORPORATION WATERWORKS
CONTRACT H.W.5

THE Waterworks Committee invite Tenders for the Supply, Delivery and Jointing, etc., of approximately 2,000 lineal yds of Multi-Core Cable for automatic control purposes, etc., at the Haweswater Works, Westmorland.

Specification, etc., together with route plan, may be obtained on application to the Secretary, Waterworks Offices, Town Hall, Manchester 2, on payment of the sum of one guinea, which sum will only be returned on receipt of a bona fide tender and all the documents lent.

Sealed tenders endorsed as directed and addressed to the Chairman of the Waterworks Committee, Town Hall, Manchester 2, must be delivered not later than 10 a.m. on Friday, 31 Dec., 1954.

PHILIP B. DINGLE,
Town Clerk.

Town Hall,
Manchester, 2.
30 Nov., 1954. (P 126)

### NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD
CLUNIE SUBSTATION, PITLOCHRY

TENDERS are invited for the provision of outdoor 132 kV Switchgear and Ancillary Equipment for Clunie Substation. Copies of the Tender Document may be obtained on application with a cheque for £2. 2s. (returnable) to the Engineers, Messrs Kennedy and Donkin, 12 Caxton St, London, S.W.1. The Board do not bind themselves to accept the lowest or any Tender.

W. D. D. FENTON,
Secretary.

16 Rothesay Ter,
Edinburgh 3. (P 144)

### BOROUGH OF MACCLESFIELD
GROUP "A" AND GROUP "B" SODIUM DISCHARGE STREET LIGHTING COARE ST, WESTMINSTER RD AND KING EDWARD ST

TENDERS are invited for the supply and and erection of 8 Group "A" Sodium Lighting Units mounted on reinforced concrete columns and the supply only of 18 Group "B" units and columns.

Specification, Bill of Quantities and Form of Tender may be obtained from Mr J. H. Dossett, A.M.I.C.E., Borough Engineer, Town Hall, Macclesfield, on payment of a deposit of £2. 2s. to be returned on receipt of a bona fide tender.

Tender, with completed Bill of Quantities, enclosed in plain sealed envelope, endorsed "Street Lighting, Coare St, etc." to be delivered to the undersigned not later than noon on Wednesday, 5 Jan., 1955.

The Council do not bind themselves to accept the lowest or any Tender.

WALTER ISAAC,
Town Clerk.

Town Hall,
Macclesfield,
2 Dec., 1954. (P 140)

### COUNTY COUNCIL OF THE WEST RIDING OF YORKSHIRE

TENDERS are invited for the RE-WIRING OF THE ELECTRICAL INSTALLATION in the HARROGATE TECHNICAL SCHOOL AND SCHOOL OF ART.

Specification and Drawings, together with Conditions of Tender, may be obtained on application to the County Architect, "Bishopgarth," Westfield Rd, Wakefield, on payment of a deposit of £2. 2s. which will be returned on receipt of a bona fide tender. Cheques must be made payable to the West Riding Treasurer and crossed "& Co."

Sealed Tenders must be addressed to me, the undersigned and received at Room 3, County Hall, Wakefield, not later than 10 a.m. on Monday, 10 Jan., 1955.

BERNARD KENYON,
Clerk of the County Council.
(P 127)

## APPOINTMENTS VACANT

*Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.*

### SOUTH EAST SCOTLAND ELECTRICITY BOARD
**Southern Sub-Area**

FARM SALES REPRESENTATIVES for Berwick and Hawick Districts. Salary Scale £485/£545 p.a. with placing according to qualifications and experience. Candidates should have experience in the applications of electricity in farm and garden, and general electrical and farming background knowledge.

Applications stating age, qualifications and experience should reach the Board at High St, Galashiels, by 18 Dec., 1954. (P 156)

### THE UNITED KINGDOM ATOMIC ENERGY AUTHORITY
**Aldermaston, Berks**

requires an EXPERIMENTAL OFFICER or ASSISTANT EXPERIMENTAL OFFICER for the development and testing of high voltage cable connectors and experimental investigation of the application of casting resins to electrical and electronic problems. The minimum qualification is Higher National Certificate in Electrical or Communication Engineering, and applicants for the Experimental Officer post should be at least 26 years of age. The salary scales are Experimental Officer £690/£850 (male) per annum, Assistant Experimental Officer £276 (at age 18) /£615 (male) per annum. The successful applicant will be required to join the Authority's Principal Superannuation Scheme to be introduced shortly, and the salary scales quoted above will be enhanced to cover contributions. Houses will be available within a reasonable period for married officers who live outside the Establishment's transport facilities. An initial period of duty will probably have to be served at Fort Halstead, Sevenoaks, Kent. Application form from Senior Recruitment Officer, A.W.R.E., Aldermaston, Berks. Quote Ref. 295/WGE/49.

(P 104p)

### BRITISH ELECTRICITY AUTHORITY
**South Wales Division**

APPLICATIONS are invited for the following superannuable N.J.B. appointments:

DIVISIONAL LABORATORY,
UPPER BOAT POWER STATION
Vacancy No. 113/54

JUNIOR ENGINEER (Chemist), Male or Female, in the Divisional Laboratory, situated at Upper Boat Power Station.

Salary AX/CX 7, £475/£590.

Applicants should have had practical laboratory experience, preferably connected with water, fuel and oil. Possession of H.N.C. (Chem.) desirable.

Closing date: 20 Dec., 1954.

UPPER BOAT POWER STATION
Vacancy No. 115/54

ASSISTANT SHIFT CHARGE ENGINEER. Salary H9, £755 by £15—£800 per annum.

H.N.C. and regular apprenticeship desirable, experience in a modern generating station essential.

Closing date: 24 Dec., 1954.

Application forms obtainable from Secretary South Wales Division, British Electricity Authority, Twyn-y-Fedwen Rd, Gabalfa, Cardiff. (P 141)

### THE EAST MIDLANDS ELECTRICITY BOARD
**Derby and Burton Sub-Area**

APPLICATIONS are invited for the appointment of a GENERAL ASSISTANT ENGINEER in the Derby District of the Derby and Burton Sub-Area.

The salary and conditions for the post will be in accordance with the National Joint Board Schedule, Class G, Grade 9, at present £715/£760 per annum.

Applicants should have a technical qualification equivalent to the Higher National Certificate in Electrical Engineering, and have experience in the construction, maintenance and operation of High and Low Voltage networks.

The successful candidate will be required to undertake standby duties and to reside in or near to Derby.

Applications for the above post, stating age, qualifications and experience, present post and salary, should reach F. H. Pooles, Esq, M.I.E.E., Sub-Area Manager, 36 Full St, Derby, and be received within 14 days of this advertisement. (P 119)

## YORKSHIRE ELECTRICITY BOARD
### No. 2 (Huddersfield) Sub-Area

SECOND ASSISTANT COMMERCIAL ENGINEER (POWER SALES)

APPLICANTS should preferably be Corporate Members of the Institution of Electrical Engineers and must have had wide and responsible commercial experience in the Industry, particularly in the development of industrial supplies, including negotiations with large power consumers and the formulation of Supply Agreements. They must be capable of advising potential industrial consumers on questions relating to Fuel efficiency.

Salary—N.J.B. Class K, Grade 7, £975/£25/£1,050 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 2 (Huddersfield) Sub-Area, Yorkshire Electricity Board, Market St, Huddersfield, not later than 23 Dec., 1954.

### No. 3 (Sheffield) Sub-Area

GENERAL ASSISTANT ENGINEER (COMMUNICATIONS)—METERS, TESTING AND PROTECTION

Applicants should be technically qualified to Higher National Certificate standard and have had experience in planning, installing and maintaining line telc-communication and remote control systems, and in the maintaining of radio telephone communication equipment. A knowledge of protective relays and systems will be an advantage.

Salary—N.J.B. Class M, Grade 13, £755/£15/£800 per annum.

ENGINEERING DRAUGHTSMAN

Applicants should be first class draughtsmen, preferably with experience on mains recording with a Public Utility Authority, capable of compiling accurate and permanent records from particulars obtained on site, and carrying out survey work for the revision of ordnance maps and plans.

Salary—N.J.B. Schedule D, Grade 6, £510/£20/£630 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial St, Sheffield, not later than 23 Dec., 1954.

### No. 5 (Wakefield) Sub-Area

Castleford District

SECOND ASSISTANT DISTRICT ENGINEER

Applicants must be Corporate Members of the Institution of Electrical Engineers or hold equivalent qualifications. They must have had a sound practical training and extensive experience in the design, construction, operation and maintenance of H.V. and M.V. overhead and underground distribution systems, substation plant and ancillary equipment, preferably in a large undertaking.

Salary—N.J.B. Class F, Grade 7, £755/£15/£800 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Rd, Wakefield, not later than 23 Dec., 1954.

### No. 7 (Grimsby) Sub-Area

Grimsby District

DEMONSTRATOR

Applicants must have had a two years' full-time course in domestic subjects at a recognised Training College and possession of the E.A.W. Certificate will be an advantage.

Salary—N.J.C. Grade 1, £400/£490 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Rd, Grimsby, not later than 23 Dec., 1954. (P 151)

## BRITISH ELECTRICITY AUTHORITY
### South West Scotland Division

MAINTENANCE ENGINEER (ELECTRICAL) KILMARNOCK GENERATING STATION

APPLICATIONS are invited for the position of Maintenance Engineer (Electrical) at Kilmarnock Generating Station.

Applicants should have received a good technical education and have extensive experience of electrical equipment and the organisation of maintenance in a Power Station. The salary will be Grade 6, Class "F" of Schedule "A" of the N.J.B. Agreement. A house may be available.

Applications on Form AE.6, which may be obtained from Divisional Headquarters or any Divisional Office of the Authority, should be forwarded to the Divisional Secretary, 168 Broomhill Drive, Glasgow, W.1, before Friday, 24 Dec., 1954.

A. CHRISTIANSON,
Divisional Secretary.
(P 125)

## PROFESSIONAL ENGINEERS IN VARIOUS GOVERNMENT DEPARTMENTS

THE Civil Service Commissioners invite applications for pensionable posts in a wide variety of mechanical and electrical engineering duties.

Candidates must be under 35 on 1 Jan., 1955, with extension for regular service in H.M. Forces and up to two years for permanent civil service. For the Post Office they must be at least 21, for the Ministry of Supply and Ministry of Transport and Civil Aviation at least 23, and for all other Departments at least 25 on that date.

Generally a candidate must possess a University Degree in Engineering or be a Corporate Member of one of the professional institutions—Mechanical Engineers, Electrical Engineers, or Civil Engineers or have passes in, or exemption from, Sections A or I and B or II of the corresponding Associate Membership examinations. Exceptionally candidates of high professional attainment, but without the specified qualifications, may be admitted. For some posts Associate Fellowship of the Royal Aeronautical Society or an Honours degree in Physics or Engineering will be accepted.

London salary scale (men) £650 (at age 25) to £1,000. Starting salary according to age up to £900 at 34. Candidates entering below age 25 will start at salaries varying from £450 at age 21 to £570 at age 24. Prospects of promotion. Salaries of next higher grades are £1,000/£1,320 and £1,375/£1,575. Somewhat lower for women and in the provinces.

Further particulars and application forms from Civil Service Commission, Scientific Branch, 30 Old Burlington St, London, W.1, quoting No. S85/54. Completed applications must be returned by 31 Dec., 1954. (P 143)

## BRITISH ELECTRICITY AUTHORITY
### Midlands Division

APPLICATIONS are invited for the following positions at Hams Hall Power Stations. N.J.B. service conditions, superannuable appointments, salaries within Schedule "A" of the Agreement:

(*a*) FIRST ASSISTANT STATION CHEMIST, Grade L9, commencing at £900 per annum (Vacancy No. 834 MD).

(*b*) SECOND ASSISTANT STATION CHEMIST, Grade L11, commencing at £790 per annum (Vacancy No. 835 MD).

Applicants for these positions should have had experience in the analysis of fuel, waters and oils, as applicable to modern H.P. power stations. A knowledge of modern methods of water treatment, and of the control of boiler water conditions is desirable. The minimum qualification required is Higher National Certificate in Chemistry or its equivalent.

Apply, quoting the vacancy number, on form AE6, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 29 Dec., 1954. (P 159)

## AIR MINISTRY

require MECHANICAL and ELECTRICAL ENGINEERS in Works Department for design, operation and maintenance of mechanical and electrical services on R.A.F. stations at home and overseas and Civil Aviation stations. Appointments in two grades (*a*) Main Grade, salary scale £1,080/£1,426, (*b*) Assistant Grade, £702/£1,080. Starting pay according to qualifications and experience. Salaries somewhat lower in provinces. Candidates should be age 25 or over. Appointments temporary and non-pensionable but with long-term possibilities. Special Allowance up to £1,500 a year according to location payable in addition to salary during overseas service. Candidates must be natural-born British subjects of natural-born British parents.

Minimum qualifications and experience for both grades of posts: (i) (*a*) University degree or equivalent diploma in electrical and/or mechanical engineering and at least a two-year apprenticeship or (*b*) Graduate or Corporate Membership of the Institutions of Mechanical or Electrical Engineers with appreciable electrical engineering experience and at least three years' apprenticeship and (ii) employment in responsible position for minimum of three years with well-established engineering concern providing wide experience in electrical and mechanical engineering practice.

Application forms quoting reference D.530/54-A from M.L. and N.S., Technical and Scientific Register (K), Almack Hse, King St, London, S.W.1. (P 117)

## BRITISH ELECTRICITY AUTHORITY
### Midlands Division

SECOND ASSISTANT ENGINEER (Civil) is required in the Generation Construction Department at Wolverhampton. N.J.B. service conditions, superannuable appointment, salary within Schedule "C," Grade 2, of the Agreement, commencing in range £950/£1,075, ultimately rising to £1,165 per annum.

Applicants should have had considerable experience in the design and construction of heavy foundations and building works associated with modern generating stations; also in the preparation of preliminary schemes and estimates, specifications, bills of quantities for civil engineering and building works, writing of reports, and general control of building and civil engineering contracts. Sound theoretical and practical experience on large contract work is essential. Candidates should preferably be corporate members of the Institution of Civil or Structural Engineers.

Apply, quoting Vacancy No. 837MD on form AE6, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 29 Dec., 1954. (P 158)

## MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:

COMMERCIAL ASSISTANT (TECHNICAL) in the Northwich District. Salary £555/£600 p.a. (N.J.B. E.11).

Applicants should have had a sound technical training. Possession of the H.N.C. in Electrical Engineering advantageous. Duties include dealing with general consumer enquiries on the use and supply of electricity, including estimating for installation work.

JUNIOR COMMERCIAL ASSISTANT (TECHNICAL) in the Warrington District. Salary £475/£520 (N.J.B. F.14).

Applicants should be in possession of the Ordinary National Certificate in Electrical Engineering or other equivalent qualification. Duties include estimating for contracting work, advising consumers on matters relating to electricity supplies, and the utilisation of electrical equipment.

Appointments superannuable and subject to medical examination.

Application forms obtainable from the Manager, No. 2 Sub-Area, MANWEB, Sandiway Hse, near Northwich, Cheshire. Closing date: 20 Dec., 1954. (P 101)

**BRITISH ELECTRICITY AUTHORITY**
**North West, Merseyside & N. Wales Division**

APPLICATIONS are invited for the appointment of SENIOR DRAUGHTSMAN (MECHANICAL) in the Liverpool Office of the Construction Department, Springwood Hse, Liverpool. Salary £640/£740 per annum, Grade 5, Schedule "D" to the National Joint Board Agreement. Superannuable and subject to medical examination.

Applicants should have had a good general and technical education, preferably possess the Higher National Certificate in engineering and have had some experience in a Drawing Office associated with the construction of modern power stations or allied plant. The successful applicant will be required to prepare drawings and diagrams associated with power station plant and equipment, and check drawings and diagrams submitted by contractors.

Application forms from the Divisional Controller, Beaconsfield Rd, Woolton, Liverpool. Closing date: 31 Dec., 1954. (P 133)

**SOUTH EASTERN ELECTRICITY BOARD**
ASSISTANT ENGINEER
Folkestone District

SALARY £635/£680 p.a. under N.J.B. Class D, Grade 8. Superannuable. Applicants must have had a sound practical training and experience in the design, construction, operation and maintenance of H.V. and M.V. Overhead and Underground distribution systems, substation plant and ancillary equipment, and preferably hold the Higher National Certificate, or its equivalent in Electrical Engineering.

Applications, naming 2 referees to P. V. Gurr, J.P., District Manager, SEEBoard, York Hse, Cheriton Gdns, Folkestone, Kent, by 22 Dec., 1954.

A. L. BURNELL,
Secretary.
(P 155)

**BRITISH ELECTRICITY AUTHORITY**
**South Western Division**

STATION SHIFT CONTROL ENGINEER required at Feeder Rd Generating Station.

Superannuation Scheme. Salary—N.J.B. Class "E," Grade 10, £595/£640.

Applicants should possess good technical qualifications, and have had training and experience in the control and operation of steam generating plant and main switchgear.

Applications on Form A.E.6/ACT, obtainable from the Divisional Secretary 26 Oakfield Rd, Bristol 8, should be completed and returned by 20 Dec., 1954. (P 152)

**THE SOUTH WEST SCOTLAND ELECTRICITY BOARD**
**Lanarkshire Sub-Area**
APPOINTMENT OF GENERAL ASSISTANT ENGINEER (CONSTRUCTION)

APPLICATIONS are invited for the appointment of General Assistant Engineer in the Sub-Area Construction Department at Hamilton.

Candidates should have had a sound electrical engineering training and have some experience of construction work appertaining to a large Distribution System.

The Salary and Conditions of Service will be in accordance with the National Joint Board's Agreement, Revised Schedule "A," present Classification and Grading being K.13, Salary £675/£720 per annum which will be subject to the statutory deductions including superannuation. The successful candidate will require to reside within a reasonable distance of the Sub-Area Office at Hamilton.

Application forms, which may be obtained from the undersigned, should be forwarded to this office within 14 days of the date of this advertisement.

DUGALD SMITH,
Manager.

137 Almada St,
Hamilton. (P 103)

**BRITISH ELECTRICITY AUTHORITY**
**South Eastern Division**
CROYDON "B" POWER STATION

ASSISTANT ENGINEER (Operation and Efficiency)—Class J, Grade 8, £840/£900 p.a. plus London Allowance. Applicants who should possess a Higher National Certificate must have had experience in the operation of modern Power Station plant, plant testing and investigation and be familiar with the use of testing equipment.

ASSISTANT SHIFT CHARGE ENGINEER—Class J, Grade 9, £790/£850 p.a. plus London allowance. Applicants should have had a sound technical education and experience in the efficient operation of modern high pressure Power Station plant with P.F. firing together with experience in the control of labour.

Applications for both positions to Station Superintendent, Croydon "B" Power Station, Beddington Farm Rd, Croydon, Surrey, by 18 Dec., 1954.

DIVISIONAL HEADQUARTERS STAFF

THIRD ASSISTANT ENGINEER (Divisional Assistant Chemist) based at Croydon "B" Power Station—Class AX/DX, Grade 4, £750/£875/£950 p.a. plus London allowance. Applicants should possess B.SC. or A.R.I.C. degrees, but consideration will be given to those with H.N.C. (Chemistry) having suitable industrial experience. Duties involve investigations into chemical problems related to Power Generation covering a wide field of inorganic chemistry with particular reference to water and fuel.

Applications to Establishments Officer, British Electricity Hse, Lower Ham Rd, Kingston-on-Thames, by 18 Dec., 1954. (P 147)

**THE NORTH WESTERN ELECTRICITY BOARD**
APPOINTMENT OF SENIOR ASSISTANT, REVENUE AND BANKING SECTION, CHIEF ACCOUNTANT'S DEPARTMENT, AREA BOARD HEADQUARTERS, MANCHESTER

APPLICANTS should possess a recognised Accountancy qualification and have a wide experience in Accountancy, including preferably the preparation and completion of final accounts.

Salary Scale: £805/£895 p.a. Grade 7. N.J.C. Conditions.

Applications to Establishments Officer, The North Western Electricity Board, Cheetwood Rd, Manchester 8, by 18 Dec., 1954.

APPOINTMENT OF GENERAL ASSISTANT DISTRICT COMMERCIAL ENGINEER
BURNLEY DISTRICT

Duties will include general assistance in all commercial activities in the district. A sound knowledge of electrical installation work is desirable. Preference given to applicants who hold the H.N.C. in Electrical Engineering.

Salary Scale: £595 by £15—£640 p.a. Grade F.11. N.J.B. Conditions.

Applications to Sub-Area Manager, No. 5 Sub-Area The North Western Electricity Board, Jubilee St, Blackburn, by 18 Dec., 1954. (P 123)

**TECHNICAL INSTRUCTOR**
**(Electrical)**

required for NIGERIA for two tours of 15-24 months or three tours of 10-12 months, with option of appointment either (*a*) on agreement with prospect of permanent and pensionable employment in salary scale (including expatriation pay) £750 rising to £1,175 a year or (*b*) on temporary contract in salary scale (including expatriation pay) £807 rising to £1,269 a year with a gratuity at rate of £100/£150 a year. Outfit allowance £60. Free passages for officer and wife. Assistance towards cost of children's passages or grant up to £150 annually for maintenance in U.K. Liberal leave on full salary. Candidates, under 40 years of age, must have served an apprenticeship to electrical engineering and be experienced practical tradesmen. They must hold a C. and G. or other recognised technological certificate, and have had experience in apprentice training. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2A/29963/EE. (P 154)

**NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD**
**Dundee Area**

APPLICATIONS are invited for the post of ASSISTANT CHARGE ENGINEER at Carolina Port Generating Station, Dundee, at a salary in accordance with Class F, Grade 9, of the N.J.B. Schedule (£675 x £15—£720). Superannuation Scheme applicable.

Applications giving age, qualifications and experience should reach the undersigned not later than fourteen days from the appearance of this advertisement.

P. PHILIP, M.I.MECH.E., M.I.E.E.,
7 Dudhope Crescent Rd, Area Manager.
Dundee.
Dec., 1954. (P 174)

**SOUTH EAST SCOTLAND ELECTRICITY BOARD**
**Southern Sub-Area**

FOREMAN for Meter Test Department, Galashiels. Applicants should have experience in overhaul, repair and calibration of all types of electricity meters and instruments, and should be capable of supervising the routine work of a Class A Polyphase Testing Station. N.J.I.C. Grade 3, £505 per annum.

Applications, stating age, experience and qualifications should reach the Board at High St, Galashiels, by 21 Dec., 1954. (P 153)

**MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD**

SENIOR ASSISTANT ENGINEER (OPERATION) required at No. 1 Sub-Area Headquarters, 24 Hatton Garden, Liverpool 3. Salary £1,295 by £35 to £1,400 (N.J.B. L.4).

Applicants should be Chartered Electrical Engineers and should have had wide experience in the maintenance and operation of large transmission and distribution networks up to and including 33 kV.

The appointment is superannuable and subject to medical examination.

Special application forms, obtainable from the Manager, above address, should be returned not later than 20 Dec., 1954. (P 100)

**BRITISH ELECTRICITY AUTHORITY**
**Yorkshire Division**

REQUIRE a SENIOR DRAUGHTSMAN (Mechanical) in the Generation Construction Department, Leeds.

Salary £640/£740 per annum, Grade 5, Schedule D, N.J.B. Agreement.

Applicants should be experienced in heavy engineering and Power Station construction, especially the installations of H.P. plant and pipework.

Application forms obtainable from Divisional Secretary (Establishments), British Electricity Hse, St. Mary's Rd, Leeds 7, to be returned within 14 days of the appearance of this advertisement.

G. A. VOWLES,
Divisional Controller.
(P 148)

**MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD**

APPLICATIONS are invited for the appointment of SERVICE CENTRE SUPERVISOR at Warrington. Salary within the range £670/£730 p.a. (N.J.C. Grade 5).

Applicants should have had a sound training on the commercial side of an electricity undertaking or in the electrical retail trade, and must have a wide knowledge of modern electrical appliances for commercial and domestic use.

The duties will include the supervision and control of the Service Centre, the display of apparatus, hire purchase transactions, and receipt of accounts.

The appointment is superannuable and subject to medical examination.

Applications, stating age, experience, qualifications, and present appointment, should be sent to the Manager, No. 2 Sub-Area, MANWEB, Sandiway Hse, near Northwich, Cheshire, not later than 17 Dec., 1954. (P 124)

## SOUTHERN ELECTRICITY BOARD

DISTRICT COMMERCIAL ENGINEER

BASINGSTOKE District of No. 3 (Portsmouth) Sub-Area. Salary N.J.B. Class D, Grade 4 (£790 x £20—£850). N.J.B. Conditions of Service. For classification purposes under the N.J.B. Agreement the Unit Assessment for the District was just under 48 millions in March, 1954.

Applicants must have had considerable experience on the commercial side of the Electricity Supply Industry, especially in relation to rural development. They should possess a good knowledge of tariffs, sales, commercial statistics, electrical contracting and all aspects of consumer service. The possession of suitable technical qualifications would be an advantage.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him in envelopes suitably endorsed, not later than 29 Dec., 1954.

ASSISTANT ENGINEER (PLANNING)

Aldershot District of No. 3 (Portsmouth) Sub-Area. Salary N.J.B. Class F, Grade 9 (£675 x £15—£720). N.J.B. Conditions of Service.

The duties of the post will be to assist the Planning Engineer in the preparation of schemes and estimates for extensions of and reinforcement to overhead and underground H.V. and L.V. networks, and the person appointed will be required to undertake standby duties if required. The possession of suitable technical qualifications will be an advantage.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him in envelopes suitably endorsed, not later than 29 Dec., 1954.

SENIOR DRAUGHTSMAN (CIVIL ENGINEERING)

No. 1 (Southall) Sub-Area, Waterloo Rd, Uxbridge. Salary N.J.B. Schedule D, Grade 5 (£672/£777 per annum, inclusive of London Allowance). N.J.B. Conditions of Service.

Applicants should have had training and experience in building construction and the design of steelwork and reinforced concrete structures, and be capable of preparing drawings, and making calculations.

Applications on forms obtainable from the Sub-Area Secretary, 2/6 Windmill Lane, Southall, Middlesex, and returned to him not later than 29 Dec., 1954.

ASSISTANT ENGINEER (GENERAL)

Southampton District of No. 4 (Bournemouth) Sub-Area. Salary N.J.B. Class F, Grade 11 (£595 x £15—£640). N.J.B. Conditions of Service.

Applicants should have had experience in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems, substation plant and distribution equipment. The appointment will involve standby duties.

Applications on forms obtainable from the Sub-Area Secretary, No. 1 Priory Rd, Bournemouth, and returned to him in envelopes suitably endorsed, not later than 20 Dec., 1954.

JUNIOR ENGINEER

Aldershot District of No. 3 (Portsmouth) Sub-Area. Salary N.J.B. Class F, Grade 14, commencing at £475 per annum. N.J.B. Conditions of Service.

Applicants will be required to assist in distribution duties including minor construction work and general maintenance of H.V. and L.V. overhead and underground distribution systems, substation plant and distribution equipment, and possess suitable technical qualifications. The appointment will involve standby duties.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him in envelopes suitably endorsed, not later than 29 Dec., 1954.

The successful candidates for the above appointments will be required to contribute to the B.E.A. and Area Boards' Superannuation Scheme, if eligible. (P 145)

## MIDLANDS ELECTRICITY BDOAR

APPLICATIONS are invited for the following superannuable posts:

GENERAL ASSISTANT DISTRICT COMMERCIAL ENGINEER, SUTTON COLDFIELD AND NORTH-EAST BIRMINGHAM DISTRICT, BIRMINGHAM AND DISTRICT SUB-AREA

Duties involve assisting with enquiries and advising consumers at the Industrial Service Centre on the most suitable type of industrial electrical equipment for their purposes. Experience necessary in the application of electricity for industrial uses. Technical qualifications desirable. Salary £715/£760 per annum (N.J.B. Grade J.11). Applications stating age, qualifications, experience and present salary, endorsed "General Assistant District Commercial Engineer—Industrial," should be delivered within 14 days to Emil Braathen, Sub-Area Manager, Midlands Electricity Board, 14 Dale End, Birmingham, 4.

GENERAL ASSISTANT DISTRICT ENGINEER, SHREWSBURY DISTRICT, SHROPSHIRE AND HEREFORDSHIRE SUB-AREA

Experience necessary in all branches of distribution work including operation and maintenance of high and low voltage underground and overhead distribution systems. Technical qualifications desirable. Salary £595/£640 per annum (N.J.B. Grade E.10).

GENERAL ASSISTANT DISTRICT ENGINEER, WELLINGTON DISTRICT, SHROPSHIRE AND HEREFORDSHIRE SUB-AREA

The successful applicant will be required to assist in the construction and maintenance of E.H.V. and L.V. overhead and underground mains. Technical qualifications desirable. Salary £555/£600 per annum (N.J.B. Grade E.11).

Apply, in writing, within 14 days stating age, experience, present salary and position to Mr W. Winwood, Sub-Area Manager, Midlands Electricity Board, Spring Gdns, Ditherington, Shrewsbury.

DISTRICT COMMERCIAL ENGINEER, WEDNESBURY DISTRICT, SOUTH STAFFS AND NORTH WORCS SUB-AREA

Applicants should have had extensive experience in the industrial and domestic aspects of commercial work including installations, public lighting and sales and service to the consumer. The duties will include development of industrial, commercial and domestic load, supervision and control of contracting department, preparation of specifications for electrical installations and public lighting schemes. Preference will be given to applicants who are Associate Members of the I.E.E. or hold equivalent qualifications. Salary £975/£1,050 per annum (N.J.B. Grade G.4). Applications received in response to previous advertisement will be reconsidered. Apply, in writing, within 14 days stating age, training, qualifications, experience, present position and salary to Mr T. G. Keeler, Sub-Area Manager (Ref. C.W.) Midlands Electricity Board, Toll End Road, Tipton, Staffs.

A. STEPHENS,
Secretary.
(P 146)

## BRITISH ELECTRICITY AUTHORITY

### Eastern Division

APPLICATIONS are invited for the following appointments in the Generation (Construction) Department at Divisional Headquarters:

SENIOR DRAUGHTSMEN (MECHANICAL)

Salary Schedule "D," Grade 4, £787 by £20—£892 per annum.

The commencing salary will depend upon experience and qualifications. Applicants should preferably have experience in Generating Station plant layout and design of pipework, coal, ash and dust handling systems, etc.

Applications stating age, qualifications and experience should be sent to the Controller, British Electricity Authority, Eastern Division, Northmet Hse, Southgate, N.14, by 23 Dec., 1954.

W. N. C. CLINCH,
Controller.
(P 131)

## BRITISH ELECTRICITY AUTHORITY

### East Midlands Division

APPLICATIONS are invited for the following positions within the Division:

ASSISTANT SHIFT CHARGE ENGINEER (BOILERHOUSE), LONGFORD POWER STATION, COVENTRY

Vacancy No. 181/54/ET

Applications are invited from suitably qualified Engineers to take charge of shift operation of Boiler House Plant.

Applicants must possess a sound technical training, have had good general engineering experience, a knowledge of the control and operation of large water tube boilers, ancillary plant and in the efficient combustion of fuels on Chain Grate Stokers.

The salary will be within Class G, Grade 9 (£715 by £15—£760 per annum) of the National Joint Board Schedule A.

Closing date for receipt of applications, 16 Dec., 1954.

JUNIOR ENGINEERS, FREEMEN'S MEADOW POWER STATION, LEICESTER

Vacancy No. 185/54/ET

Some experience in Control Room and Boiler House work in a large P.F. Station is required. Technical qualifications up to H.N.C.

Salary in accordance with Class H, Grade 16 (£475 by £15—£520 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 23 Dec., 1954.

These appointments will be pensionable within the terms and provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form A.E.6/ACT which may be obtained from the Divisional Establishments Officer, British Electricity Authority, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote Vacancy No.

L. F. JEFFREY,
Divisional Controller.
3 Dec., 1954. (P 149)

## BRITISH ELECTRICITY AUTHORITY

### Midlands Division

MAINTENANCE ENGINEER (Mechanical) is required at Walsall and Birchills Power Stations. N.J.B. service conditions, superannuable appointment, salary within Schedule "A," Grade H6, commencing at £900 per annum.

A sound technical training and practical experience in modern power station mechanical maintenance is required, and the possession of appropriate technical qualifications will be an advantage.

Apply, quoting vacancy No. 836MD on form AE6, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 29 Dec., 1954. (P 157)

## TRANSFORMER DESIGNERS AND DESIGNER-DRAUGHTSMEN

BRUCE PEEBLES AND CO., LTD., ENGINEERS, EDINBURGH 5, have vacancies in their Transformer Department for the following appointments:

(*a*) DESIGN ENGINEER with experience of transformers up to 10,000 kVA and interested in larger high voltage units.

(*b*) DESIGN ENGINEER with experience of, and particularly interested in, transformers up to 1,000 kVA.

(*c*) DESIGNER-DRAUGHTSMEN capable of undertaking complete electrical and mechanical layout of large high-voltage transformers and supervising detail work.

Application is also invited from Graduates, preferably with post graduate Works experience, to undertake design and development associated with large power transformers.

Salaries commensurate with experience and qualifications; permanent appointment, with Pension and Production Bonus Schemes; five-day week; assistance in obtaining house accommodation.

Applications to Mr R. W. Flux, Manager, Transformer Department, at the above address. (P 91)

**BRITISH ELECTRICITY AUTHORITY**

**North West, Merseyside & N. Wales Division**

VACANCY NO. 232/54/T, STATION SHIFT CONTROL ENGINEER, Padiham Generating Station. Salary £595 by £15—£640 (E.10).

Vacancy No. 234/54/T, STATION SHIFT CONTROL ENGINEER, Buccleugh St Generating Station, Barrow. Salary £555 by £15—£600 (D.10)

Applications, quoting Vacancy No. to Controller, British Electricity Hse, 825 Wilmslow Rd, Manchester 20, before 18 Dec. (P 132)

**SOUTH WESTERN ELECTRICITY BOARD**

FIRST ASSISTANT DISTRICT ENGINEER—PLYMOUTH

SALARY N.J.B. Class "F," Grade 5—£840/£900 per annum.

Duties include the construction, operation and maintenance of the distribution system, including protective gear, and the preparation of capital sanction applications. Candidates should have wide experience of the engineering side of the industry and knowledge of modern street lighting schemes is desirable. Corporate Membership of the I.E.E. would be an advantage.

Application forms from the Manager, Plymouth District, Armada St, Plymouth, should be returned by 22 Dec., 1954.

Ref: 3/E30/R

2 Dec., 1954. (P 150)

APPLICATIONS are invited for the post of TECHNICAL ENGINEER in the Sales Department of Messrs Igranic Electric Co. Ltd., Bedford (a Company in the Metal Industries Group). An O.N.C. in electrical engineering is a minimum requirement; practical experience in estimating and quoting for all types of A.C. and D.C. contactor equipment desirable, although training can be given to applicants having a suitable background. Age 25-35. Please apply in writing, stating age, qualifications, salary required, etc., to the Group Training and Personnel Officer, Metal Industries Ltd., 60 Buckingham Palace Rd, London, S.W.1. (P 120)

APPLICATIONS are invited by The General Electric Co., Ltd., from YOUNG MEN who are interested in the selling of light engineering equipment. Applicants should not be over 30 years of age, and have had previous experience in a Sales Organisation. Preference will be given to those who have studied electrical engineering. The positions offer good opportunities for advancement. Apply in writing quoting reference E.S.V. to the Staff Manager, Magnet House, Kingsway, W.C.2. (P 175)

A SENIOR TECHNICAL DESIGNER with first class experience of the design of electrical accessories is required in London by The General Electric Co. Ltd. Wide experience in a works design office is essential, together with the ability and keenness to make a real contribution to the developments of the Company's electrical accessories. Applications giving full details of record and experience should be addressed to the Staff Manager (Ref.-ELS), The General Electric Company Ltd., Magnet House, Kingsway, London, W.C.2. (P 163)

A WELL-KNOWN Company manufacturing electrical rotating machinery, 1—100 h.p., has a vacancy for a SENIOR SALES ENGINEER based on their London office. The successful applicant must be trained electrical engineer with Ordinary National Certificate as a minimum qualification and with previous experience in the London or South Eastern counties area. The post carries a responsibility for the organisation and control of three sales engineers. A generous salary is offered together with non-contributory pension scheme.—Box No. 4077, Electrical Times. (P 137)

**Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2.**

A WELL-KNOWN electrical Company has a vacancy for a SENIOR FUSEGEAR SALES ENGINEER. Applicants must be trained engineers with Ordinary National Certificate as a minimum qualification and have extensive commercial experience in this field. A generous salary is offered together with non-contributory pension scheme.—Box No. 4075, Electrical Times. (P 136)

BIRMINGHAM MANUFACTURER of Electrical Products requires ENERGETIC MAN aged 30-40 in Sales Department to handle correspondence, sales records, despatch of orders, etc. Must reside in or near Birmingham and have knowledge of up-to-date Office systems and machines. Apply in confidence stating age, experience and salary required to—Box No. 4063, Electrical Times. (P 110)

CONTACTOR SWITCHGEAR LTD. ENGINEERS required for both Engineering and Estimating Departments for control gear applications up to 1,000 h.p. low and high tension.

The Company operates a contributory pension scheme and will share cost of removal in approved cases.

Applicants should have completed their National Service and preferably not over 45.

Write in confidence stating age, experience and salary required to the Secretary, Blakenhall, Wolverhampton. (P 88)

CONTRACTS ENGINEER required by Company in South Wales manufacturing electrical rotating machinery, 1—100 h.p. Applicants for preference should have served a recognised apprenticeship and possess O.N.C. as a minimum qualification. At least three years' experience in a commercial department is required. A generous salary is offered together with non-contributory pension scheme.—Box No. 4073, Electrical Times. (P 135)

DEVELOPMENT ENGINEER required. For work in conjunction with Magnetic Amplifiers as applied to Power Engineering. S.E. London Factory. Shortly moving to Crawley, Sussex, where house will be available. Write stating full details to—Box No. 4069, Electrical Times. (P 113)

DRAUGHTSMAN required for work on design of high voltage cable accessories in the Shepherds Bush area. A knowledge of mechanical engineering desirable and electrical engineering essential. 5-day week. Pension Fund. Apply in writing stating age, qualifications, experience, salary required and quoting reference number L/64/54 to Staff Officer, British Insulated Callender's Cables Limited, 21 Bloomsbury St, London, W.C.1. (P 167)

DRAUGHTSMEN required for Automatic Electric Control Gear; 5-day week, excellent working conditions; Canteen facilities; convenient transport; Incentive Bonus; Superannuation Scheme; salary according to qualifications, ability and experience. Apply Assistant Secretary, Watford Electric and Mfg. Co., Ltd., Watford, Herts. (P 29)

ELECTRICAL DRAUGHTSMAN required, capable of setting out Power and Lighting Installations, with all diagrams, etc.

Apply, stating age, with copies of references, to—Box No. 4061, Electrical Times. (P 92)

ELECTRICAL ENGINEER required, age about 25/30 years, to assist in the design of electrical installations and purchasing of electrical equipment for Gasworks and Coke Oven Plants. Ordinary National Certificate or higher qualifications required, and experience of handling technical correspondence, with a knowledge of motor control gear, and/or designing electrical power and lighting distribution systems. Five-day week. Canteen. Apply by letter giving details of past experience and salary required to the Personnel Officer, Woodall-Duckham Construction Co., Ltd., 63/77 Brompton Rd, London, S.W.3. (P 134)

ELECTRONIC ENGINEER for research and development post with well-known Birmingham Company. Applicants should possess University degree and have had experience in pulse techniques and digital computer principles. The appointment offers good prospects and conditions in a substantial organisation. Pension scheme. Apply, stating age and qualifications, to—Box No. 4083, Electrical Times. (P 170)

ELECTRICAL ESTIMATOR. Simon-Carves Ltd. have a vacancy for an estimator aged 30-40 with previous experience in heavy electrical engineering. A sound technical background and some drawing office experience are essential. Initial salary will depend on age and qualifications but will be not less than £600. Working conditions and scope are good and there is a Pension Fund in operation. Write, quoting ref. HV/62, to Staff and Training Division, Simon-Carves Ltd., Cheadle Heath, Stockport. (P 109)

ELECTRICAL INSTALLATION SUPERVISOR required for a one year contract by a large industrial organisation in Jamaica, B.W.I.

Applicants should have had at least five years' experience of industrial electrical installation work in a supervisory capacity. Possession of Ordinary National Certificate in Electrical Engineering desirable but not essential. Single man preferred, but consideration will be given to married men with good experience, age between 28 and 40.

Remuneration on a generous scale according to experience and qualifications. Passages paid from England to Jamaica and back.

Send applications giving full details to Reynolds Jamaica Mines Ltd., Lydford P.O., Jamaica, B.W.I. (P 162).

ELECTRIC LAMP MANUFACTURERS (ELMA) require SELLING AGENTS (commission basis only) for all types of electric lamps including Mercury and Sodium. Applicants should be well established with Electricity Boards and other Nationalised Industries, Industrial Users and Wholesalers. Apply with fullest details of experience including Agencies held. Area available (*a*) Northern Ireland, (*b*) North Wales and Anglesey, (*c*) Hants, Sussex and Kent.—Box No. 4067, Electrical Times. (P 112)

ENGINEER OR PHYSICIST required by large Company of world-wide renown in Birmingham. Applicants should be well-qualified academically and have experience in experimental physics or instrumentation. The appointment offers good prospects and conditions in a substantial organisation. Pension scheme. Apply, giving details of age and qualifications, to—Box No. 4081, Electrical Times. (P 169)

ENGINEER, aged 22/35, required by Cable Company in London Area for testing and maintenance of electronic equipment in new instruments for automatic testing of telecommunication cables. Apply giving full particulars to—Box No. 4039, Electrical Times. (P 30)

ENGINEER, aged 25/35, with electrical or physicist degree required by Cable Company in London Area for development work on testing equipment for telecommunication cables. Permanent and pensionable position at salary commensurate with experience and qualifications. Apply giving full particulars to—Box No. 4059, Electrical Times. (P 64)

ESTABLISHED firm of electrical contractors in the Manchester area require the services of an ESTIMATING ENGINEER for industrial and commercial electrical installation contracts. Only those candidates who have had some practical and drawing board experience and who are in a position to prepare competitive estimates and schemes need apply. Reply in confidence, giving some indication of salary, age and previous experience.—Box No. 4045, Electrical Times. (P 35)

# Electrical Designers

There are vacancies, in our rapidly expanding laboratories, for men with Higher National Certificate, or equivalent, and experience in the design of small H.P. electrical machines and transformers. This interesting design work brings the successful applicants into contact with all phases of aircraft electrical engineering.

Write as fully as possible, stating your age and experience, to Group A/C, Personnel Dept., Rotax Ltd., Chandos Road, Willesden Junction, London, N.W.10.

(P 116p)

ELECTRICAL WHOLESALER, experienced COUNTER HAND required, also ASSISTANT. Apply Newey and Eyre Ltd., 243 Horn Lane, Acton, W.3. (P 107)

F.H.P. MOTOR DEVELOPMENT. ENGLISH ELECTRIC, Bradford, wish to appoint an ENGINEER to take charge of the mechanical development of electric motors and associated equipment for economic production. This is a new and interesting appointment for a fully qualified and experienced engineer. Please apply, giving full details of experience and qualifications, etc., to Ref. 1161B, Dept. C.P.S., 336/7 Strand, W.C.2. (P 164)

IGRANIC ELECTRIC CO., LTD., Bedford, have a vacancy for a SALES ENGINEER in their Bristol Office. Applicants should have served an apprenticeship in Electrical Engineering and have a knowledge of Electric Motor Control Gear. Previous sales experience an advantage but not essential, as training can be arranged. Age 25-35 years. Apply giving particulars of age, training, experience and salary required to the Group Training and Personnel Officer, Metal Industries Ltd., 60 Buckingham Palace Rd, London, S.W.1. (P142)

**SIMPLEX ELECTRIC CO., LTD.,**

require an experienced REPRESENTATIVE for the North East Midlands. Must be fully conversant with modern installation practice and able to develop the sale of the Company's products in this field. Preference will be given to an applicant who is a car owner and is resident in the Derby/Nottingham district. Applications stating age, qualifications and salary required should be made to:

**The Secretary, Simplex Electric Co., Ltd., Oldbury, Birmingham.**

(P 106p)

JOINTER (E.H.T.) required by London Electricity Board in O. and M. Branch of the South Eastern Sub-Area at Woolwich, S.E.18. N.J.I.C. rates and conditions—4s. 1d. p.h. Application forms from Personnel Officer, 46 New Broad St, E.C.2. Please enclose addressed envelope and quote ref.: M/3663/T. (P 168)

LARGE D.C. MACHINE DESIGN. ENGLISH ELECTRIC, Bradford, has a vacancy for a SENIOR ENGINEER with experience in D.C. machine design of 1,000 kW range. These motors and generators have interesting and special application in a wide industrial field. This is a senior appointment carrying an attractive salary. Please apply in strict confidence, to Ref. 758H, Dept. C.P.S., 336/7 Strand, W.C.2. (P 165)

MERZ AND MCLELLAN require MECHANICAL ENGINEERING DRAUGHTSMEN for their Esher Office. Applicants should be fully experienced in layout work, preferably in connection with Steam Power Station design. Salaries offered will be fully appropriate to applicants' experience. Pension scheme. Apply in writing to Merz and McLellan, "Milburn," Esher, Surrey. (P 62)

SWITCHGEAR DRAUGHTSMEN required, with knowledge of H.V. Outdoor Switchgear and/or 11 kV Oil-Immersed Metal-clad gear. Interview expenses paid. Help given to obtain accommodation if necessary. Apply in writing, giving details of qualifications, experience and salary, to Switchgear and Equipment Ltd., Banbury, Oxon. (P 129)

TECHNICAL REPRESENTATIVES 25/35. Men of initiative, preferably B.SC.ENG., required to handle enquiries for Lab. and Industrial Heating Equipment and to establish customer contact. Remuneration will be based on results. Write giving details of age, experience and present annual remuneration to Electrothermal Engineering Ltd., 270 Neville Rd, London, E.7. (P 166)

TECHNICAL ASSISTANTS required for investigational work in connection with radio valve manufacture. Applicants should possess at least Higher National Certificate. Five-day week, modern welfare facilities, staff pension. Apply, giving full personal details, including age, qualifications and experience, to Personnel Superintendent, The Edison Swan Electric Co., Ltd., Cosmos Works, Brimsdown, Enfield, Middlesex. (P 105)

TRANSFORMER TEST ENGINEER required having experience in routine testing of Distribution, Medium and Large Power Transformers. Preference will be given to applicants holding H.N.C. Electrical Engineering. This is a permanent position with good prospects. Apply stating age, experience and salary required to Denis Ferranti Co., Ltd., Royton, Oldham, Lancs. (P 128)

TRANSFORMER DRAUGHTSMAN required by progressive Company in London Area. Attractive salary plus bonus and excellent prospects offered to man of experience and initiative. Apply in confidence to—Box No. 4079, Electrical Times. (P 138)

**CHIEF BUYER**

Applications are invited by an East Midlands electrical engineering company for the post of Chief Buyer. Applicants must be capable of following budgetary arrangements and stock control systems and preferably have held a similar post in the electrical engineering industry. Contributory Pension Scheme. Please write stating age, experience and present salary to:

**Box 2J, M3363,**

**A.K. Advg., 212a Shaftesbury Ave, London, W.C.2.**

(P 121p)

**JOHNSON AND PHILLIPS**

require the services of a SENIOR CABLE ENGINEER in the Test and Research Department. The position involves responsibility to the Research Manager for the supervision of all research and development work on all types of power cables. A good all-round experience of the manufacture, design and installation of power cables for all voltages is essential. Experience of gas pressure and oil-filled cables is also required. Experience in the design of cable accessories would be an added advantage.

The position would carry a good salary and good prospects.

Full details of training qualifications and experience to date should be given.

**Apply Employment Manager, Victoria Way, Charlton, S.E.7.**

(P 139p)

THE ENGLISH ELECTRIC CO., LTD., Stafford, has interesting vacancies for ENGINEERS to assist with contracts for comprehensive hydro - electric schemes. Applications are invited from those having experience of this type of work and also from young engineering graduates or H.N.C. holders who have a background of practical engineering experience, preferably with a commercial bias. Please apply to Dept. C.P.S., 336/7 Strand, W.C.2, quoting ref. 756D. (P 108)

WELL-KNOWN Electrical Manufacturing Company has a vacancy for a SALES ENGINEER for electrical rotating machinery in Sheffield. Successful applicant must be a trained Electrical Engineer with O.N.C. as a minimum qualification and with previous sales experience in the area covered. He will work from the Company's existing Branch Office. Remuneration by salary and expenses. Non-contributory pension scheme. Apply—Box No. 4065, Electrical Times. (P 111)

WEST LONDON CONTRACTOR has a vacancy for ENGINEER. Experience in control of labour. O.H. Line and U.G. Jointing up to 33 kV. Permanent. Superannuation Scheme. In confidence.—Box No. 4053, Electrical Times. (P 38)

WORKSHOP TECHNICIANS (two) required at Paddington Technical College, Saltram Cres, W.9, to assist in the maintenance of equipment in the engineering laboratories; some training in the use of machine tools desirable. Salary scale £286. 17s. 6d. a year at 20 by £19. 2s. 6d. to £401. 12s. 6d. and with certain quals. to £439. 17s. 6d. (Max. comm. sal. £363. 7s. 6d.) Further particulars and appl. forms (returnable within 14 days) from Secretary (1562). (P 161)

## APPOINTMENTS WANTED

ELECTRICAL ENGINEER with Consulting Engineering experience seeks appointments, inspections, reports and recommendations, site supervision, etc. Fees reasonable. Telephone REL 2739 or—Box No. 4805, Electrical Times. (P 171)

## WORK WANTED

A.C. and D.C. MOTOR REWINDS and REPAIRS. Prompt service fully guaranteed. Edgware 5566 (4 lines).—Service Electric Co., Ltd., Stanmore, Middx. (P 4)

ARMATURE REWINDING service to the trade. Vacuums, Drills, Grinders, Hood Dryers, Dental Motors. Vacuum cleaner and drill armatures replaced from stock 24-hour service. Every job guaranteed. All vacuum cleaner parts, hoses, etc., in stock for any make. Apex washer agitator shafts stocked.—Regam Electric Cleaner Service 95 Park Lane, Leeds 1. (P 5)

CAPACITY available for light iron castings, including machining and vitreous enamelling. Diamond Foundry, Luton, Beds. (P 122)

FISHER FOUNDRIES LTD., Greet, Birmingham 11, for Machine Moulded Precision Castings in gun metal and soft grey iron. Tel.: Victoria 0197. (P 6)

## WANTED

REDUNDANT 2-3 MW FREQUENCY CHANGER required. 40-50 cycles, 3,300 V input and output complete with starting equipment and field control, would consider alternatives. Details and price to —Box No. 4071, Electrical Times. (P 130)

SPOT CASH for SCRAP MERCURY, aircraft plugs, contacts, magneto points (new and used), precious and non-ferrous scrap metals, any kind, any quantity, any time. Send particulars, Belgrave Buyers (E.T.), 5 Belgrave Gdns, London, N.W.8. MAI 7513. (P 114)

WANTED, for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. and H. Cooper Ltd. 176 Brady St, Bethnal Green, E.1. (P 1)

WANTED, ROTARY CONVERTERS, any size.—Universal, 221 City Rd, London, E.C.1. (P 3)

## AGENCIES

M.A.A.—THE BADGE OF A GOOD MANUFACTURERS' AGENT. Manufacturers requiring reputable Agents are invited to communicate with the Secretary, The Manufacturers' Agents Association of Great Britain and Ireland (Inc.), Rosebery House, 8 Breams Buildings, London, E.C.4. Membership available to established agents only. Particulars supplied. (P 118)

## FOR SALE

A.C. and D.C. MOTORS, all sizes, large stocks. Fully guaranteed.—Milo Engineering Works Ltd., Milo Rd, East Dulwich, S.E.22 (Forest Hill 2278-9). (P 7)

A HIGH VACUUM IMPREGNATION UNIT or single or batch coil impregnation service to R.I.C. specification 214 or individual requirements.—Blickvac, Hamilton Rd Works, Hamilton Rd, S.E.27. Tel. Gypsy Hill 4394. (P 14)

A.A. ELECTRICAL CO. for A.C.-D.C. MOTORS, switchgear, exhaust fans, hoists, reduction gears, new or reconditioned units.—Chi. 5105, 67 Rothschild Rd, W.4. (P 8)

A.C. and D.C. MOTORS, GENERATORS from stock.—Service Electric Co., Ltd., Honeypot Lane, Stanmore, Middx. Edgware 5566-9. (P 9)

DON'T worry about your electricity bills. Fit 1s. slot electric meters for hotels, bed-sitters, etc. Prices from 50s.—Selectrics, Department E.T., Castle Circus Hse, Torquay. Tel. 7218. Trade inquiries invited. Trade discount. (P 15)

**FLAMEPROOF MOTORS, M.G. SETS, D.C. MOTORS, GEARED MOTORS, A.C. MOTORS, TRANSFORMERS, CONTROL GEAR. SPECIALS. FLANGE MOTORS**

**ELECTROPOWER COMPANY LIMITED**

Kingsbury Works, Kingsbury Rd, London, N.W.9

Tel.: COLindale 4621/3

Grams: Lectropowa, Hyde, London (P 12)

**DIESEL ALTERNATING SETS**

1. 55 kW, A.B.O.E. Brush DIESEL ALTERNATING SET fitted with McLaren Engine, type M.R., latest model; little used since complete reconditioning by Makers, fitted for air starting with air bottle and Petter Petrol driven Compressor. 4 M.L., 4 M.R., 2 number 679 R.B. direct coupled to a Brush 69 kV, A.400/3/50. Alternator No. 4783 and Crush control panel with automatic Voltage control. The whole is mounted on a steel base plate as one unit. Price £1,000 or near offer.
2. MIRRLEES U.D. 8 ENGINE. Serial Number 74772/37 Diesel 300 h.p. at 600 r.p.m. driving by V Belts a Bruce Peebles 275 kVA alternator, 400/3/50 at 750 r.p.m. with British Electric Cos., 275 kVA control panel. This Engine was completely rebuilt in August 1952, likewise the Alternator. Price £2,500 or offer.

For the above engines there is a quantity of new spares which are offered as a separate lot at a price to be agreed.

**Wharfe Plant & Haulage Co., Ltd., Riffa Garage, Harrogate Road, Pool-in-Wharfedale, Yorks.**

(P 52p)

ELECTRIC MOTORS, D.C. and A.C., Motor Generator Sets, Alternators and Dynamos. Reconditioned and guaranteed, very large stocks held.

Britannia Manufacturing Co., Ltd., Britannia Walk, N.1. CLErkenwell 5512-3-4. Stores at Chobham, Surrey. (P 51)

E.C.C. HEAVY DUTY BATTERY CHARGER, suitable for electric recharging, new and unused although purchased several years ago. Reasonable offer accepted. College Motors Ltd., Rupert St Garage, Bristol 1. (P 173)

G.E.C. UNIT HEATERS, 5 kW, 3-phase, 4, as new, £8 each. Marshall Press, Milford Lane, Strand. TEM 9361. (P 115)

HOUSE-SERVICE METERS, a.c. or d.c., quarterly or prepayment.—Universal Electrical, 221 City Rd, London, E.C.1. (P 10)

MERCURY SWITCHES are made by Hall, Drysdale and Co., Ltd., of 58 Commerce Rd, Wood Green, London, N.22. Tel.: BOW 7221. (P 11)

PURLEY CHOKES AND BALLASTS Our 80-W tapped h.p.f. ballast with starter switchgear-holder incorporated is proving itself the most popular unit. Suitable for most fittings, 57s. 6d. each subject.—F. W. Blanshard Ltd. (Dept. E.T.), Purley, Surrey. Uplands 4818-9. (P 13)

TIME SWITCHES from stock. Reconditioned or new. 12 months' guarantee. Lists from J. W. Hughes, 3 St. Thomas St, London Bridge, S.E.1. (Tel. Hop 2759.) (P 16)

30 KW MAUDESLY D.C. Gen. drip-proof 1943 460/500 V, 65/60 amps, 1,100 r.p.m.

15 kW MAUDESLY D.C. Gen. drip-proof 1943 220 V, 68 amps, 1,100 r.p.m.

Norvic Engineering Services Ltd., LAD 2240. (P 18)

## MISCELLANEOUS

FREE! Brochure giving details of courses in Electrical Engineering and Electronics covering A.M.Bri.I.R.E., City and Guilds, etc. Train with the postal Training College operated by an Industrial Organisation. Moderate fees. E.M.I. Institutes, Postal Division Dept. ET29, E.M.I. Institutes, London, W.4. (P 19)

# INDEX TO ADVERTISERS


Aerialite Ltd. ... ... ... ... 64
Aidas Electric Ltd. ... ... ... 44
Aluminium Union Ltd. ... ... ... 10
Army Emergency Reserve ... ... 2
Auchterlonie, Chas., & Co., Ltd. ... 70
Automatic Telephone & Electric Co. Ltd. ... ... ... ... ... 27

Bill Switchgear Ltd. ... ... ... 3
Brayhead Springs Ltd. ... ... ... 66
British Driver-Harris Co. Ltd.... ... 63
British Electric Resistance Co. Ltd. ... 76
British Geon Ltd. ... ... ... 5
British Insulated Callender's Cables Ltd. *Cover* (i)
British National Electrics Ltd. *Cover* (ii)
British Thomson-Houston Co. Ltd. ... 39
Brook Motors Ltd. ... ... ... 25
Brush Electrical Engineering Co. Ltd. 11, 64

Carter, B. & F., & Co. Ltd. ... ... 72
Cayson Electrics Ltd. ... ... ... 70
Channel Conduits Ltd. ... ... ... 36
Clang Ltd. ... ... ... ... 8
Connollys (Blackley) Ltd. ... ... 9
Critchley Bros. Ltd. ... ... ... 46
Crompton Parkinson Ltd. ... ... 4

Dorman & Smith Ltd. ... ... ... 68

Edison Swan Electric Co. Ltd. ... 7, 38
Electric Construction Co. Ltd.... ... 16
Electrical Instrument Co. (Hillington) Ltd. ... ... ... ... ... 66
*Electrical Times Ltd.* ... ... ... 62
Engineering & Lighting Equipment Co. Ltd. ... ... ... ... ... 73

English Electric Co. Ltd. ... ... 15
Ensel Electric Co., Ltd. ... ... ... 74
Evershed & Vignoles Ltd. ... ... 65

Falk, Stadelmann & Co. Ltd. ... ... 69
Ferguson Pailin Ltd. ... ... ... 77
Ferranti Ltd. ... ... ... ... 33
Ferranti, Denis, Meters Ltd. ... *Cover* (iii)
Foster Transformers Ltd. ... ... 40
Fry's Metal Foundries Ltd. ... ... 31

Geipel, Wm., Ltd. ... ... ... 72
General Cable Manufacturing Co. Ltd. 75
General Electric Co. Ltd. ... 21, 26
Genristo Ltd. ... ... ... ... 2
Gilflex Conduits Ltd. ... ... ... 76
Glover, W. T., & Co. Ltd. ... ... 78
Gresham Transformers Ltd. ... ... 47

Hackbridge & Hewittic Electric Co., Ltd. ... ... ... ... ... 51
Harris, John, Tools Ltd.... ... ... 66
Henley's, W. T., Telegraph Works Co. Ltd. ... ... ... ... ... 17
Hoover Ltd. ... ... ... ... 48
Horstmann Gear Co. Ltd. ... ... 8

Igranic Electric Co. Ltd. ... ... 20
Insuloid Manufacturing Co. Ltd. ... 76
International Combustion Ltd.... ... 29

Johnson & Johnson (G.B.) Ltd. ... 19

Laurence, Scott & Electromotors Ltd.... 1
Legg (Industries) Ltd. ... ... ... 68
L.P.S. Electrical Co. Ltd. ... ... 22

Manganese Bronze & Brass Co. Ltd. ... 45
Martindale Electric Co. Ltd. ... ... 70
Meritus (Barnet) Ltd. ... ... ... 76
Mersey Cable Works Ltd. ... ... 14
Metallic Seamless Tube Co. Ltd. ... 12
Metropolitan-Vickers Electrical Co. Ltd. 43, 52
Midland Coil Winding Co. Ltd. ... 30
Midland Electric Manufacturing Co. Ltd. 49
M.K. Electric Ltd. ... ... ... 18
Morley's Electrical Services Ltd. ... 44

Oddie, Bradbury & Cull Ltd. ... ... 30

P. & B. Engineering Co. Ltd. ... ... 36
Philips Electrical Ltd. ... ... ... 13
Pinchin Johnson & Co. ... ... ... 34
Pope's Electric Lamp Co. Ltd. ... ... 67
Premier Electric Heaters Ltd. ... ... 61
Pyrene Co. Ltd. ... ... ... ... 46

Rawlplug Co. Ltd. ... ... ... 12
Record Electrical Co. Ltd. ... ... 22
Resinoid & Mica Products ... ... 46
Revo Electric Co. Ltd. ... ... ... 6
Ross, Courtney & Co. Ltd. ... ... 34
Rotunda Ltd. ... ... ... ... 72

Sanders, Wm., & Co. (Wednesbury) Ltd. ... ... ... ... ... 37
Scemco Ltd. ... ... ... ... 70
Simplex Electric Co. Ltd. ... ... 28
Smith Meters Ltd. ... ... *Cover* (iv)
Sparklets Ltd. ... ... ... ... 42
Sperryn & Co. Ltd. ... ... ... 30
Standard Telephones & Cables Ltd. ... 35
Statter, J. G., & Co. Ltd. ... ... 72

Thomas Richard & Baldwins Ltd. ... 50
Transformer & Electrical Co. Ltd. ... 74
Turnright Controls Ltd. ... ... 60

United Ebonite & Lorival Ltd.... ... 23
Universal Boilers & Engineering Co. Ltd. 32

Ward, Thos. W., Ltd. ... ... ... 24
West Insulating Co. Ltd. ... ... 74
Westinghouse Brake & Signal Co., Ltd. 71
Woods of Colchester Ltd. ... ... 41
Wootton & Co. Ltd. ... ... ... 74

Zenith Electric Co. Ltd. ... ... 42



*For*

**COOKER SWITCHES**

*Consult*

HODDESDON 3631

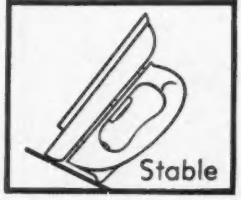
*Turnright*

TURNRIGHT CONTROLS LTD.

WEST HILL, HODDESDON, HERTFORDSHIRE.

**If your production programme demands regular weekly deliveries, we can guarantee constant supplies into your works at any specified rate. Just a part of the Turnright Service.**

# ANOTHER Fine-Quality product at the right price




The NEW Super-Smoothwell, sturdily constructed, finished in heavy chromium-plate is the iron you can SAFELY recommend! Multi-coloured packaging will make your shop window brighter. Extensive advertising will be appearing in the popular press to make sure your customers ask for Premier. Are your stocks adequate to meet the demand?

***Specification:***

**Catalogue No. 835, Quick action thermostat. Weight 5 lb., large heat selector dial, loading 750 watts. Bakelite handle.**

**Outstanding Value Price 45/-** ***ORDER NOW***

**PREMIER** *Fine-Quality*

## Super-Smoothwell

**the electric iron with the accurate heat control**

***Appearing in the following National Magazines:—***

**"Britannia & Eve", "Good Housekeeping", "Homes & Gardens", "House & Garden", "Illustrated", "Woman" and "Woman's Journal".**

PREMIER ELECTRIC HEATERS LTD., BIRMINGHAM 9

*A member of the A.E.I. Group of Companies*

***Manufacturers of Fine-Quality appliances for nearly 50 years***

## Now Available

*the NEW wallchart based on the*

# HOLGER NIELSEN

## METHOD

**of treatment for apparent death from**

# ELECTRIC SHOCK

**Instructions prepared by**

**Dr. P. Pringle, LL.B., B.Sc. (Econ.), M.R.C.S., L.R.C.P., D.I.H.**

On card size 19¼″ × 12″ printed red and black with *special high quality finish*, eyeletted and corded.

PRICE 2/6 plus postage.

Mounted on metal size 19¼″ × 12″ printed red and black, varnished, eyeletted and corded.

PRICE 5/- plus postage.

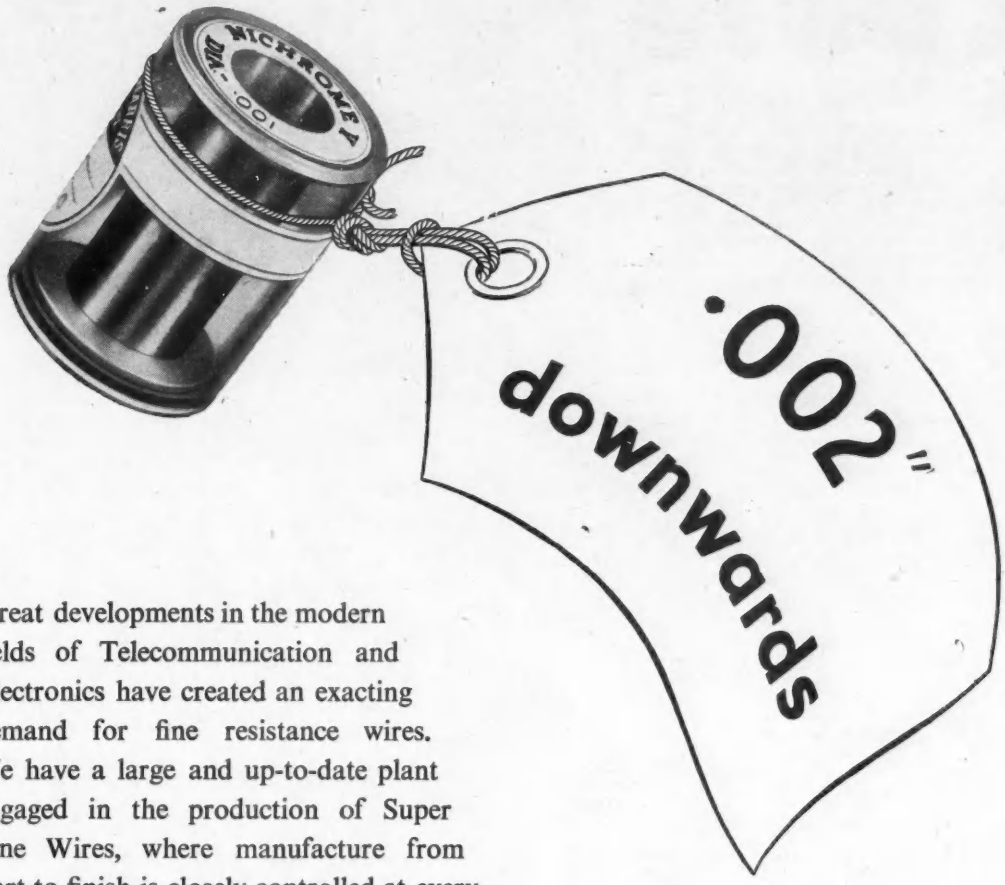
*Published by*

## THE ELECTRICAL TIMES LTD.

**Sardinia House · Sardinia Street · London, W.C.2**

*HOLborn 6016*

# SUPER FINE WIRE




Great developments in the modern fields of Telecommunication and Electronics have created an exacting demand for fine resistance wires. We have a large and up-to-date plant engaged in the production of Super Fine Wires, where manufacture from start to finish is closely controlled at every stage. We supply Super Fine Wires in all our resistance alloys, notably "Nichrome V," "Nichrome," "Karma" and "Advance," in sizes from ·002 in. (0·05 m/m) downwards.

## BRITISH DRIVER-HARRIS CO. LTD

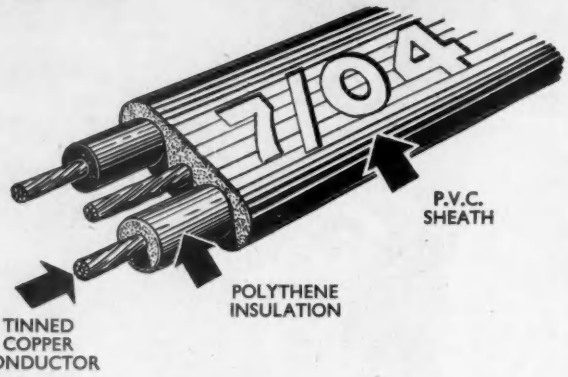
MANCHESTER 15

**Nickel and Nickel Alloy Specialists** :—for furnace elements, domestic appliances, thermo-couples, telecommunications, lamps, spark plugs, fine wires, etc.

"NICHROME" REGISTERED TRADE MARK

G

# ASHATHENE CUTS COSTS!




## SAVE ON MATERIAL

ASHATHENE is a tough yet flexible cable with tinned copper conductors insulated with polythene. The cores are colour coded in accordance with B.S.S. and I.E.E. requirements to provide ready identification. Thanks to the p.v.c. sheathing, the cable may be embedded in plaster or cement without any deterioration occurring.
Armoured ASHATHENE cables are also available for power wiring and provide that extra mechanical protection usually required in factory installations.

## SAVE ON LABOUR

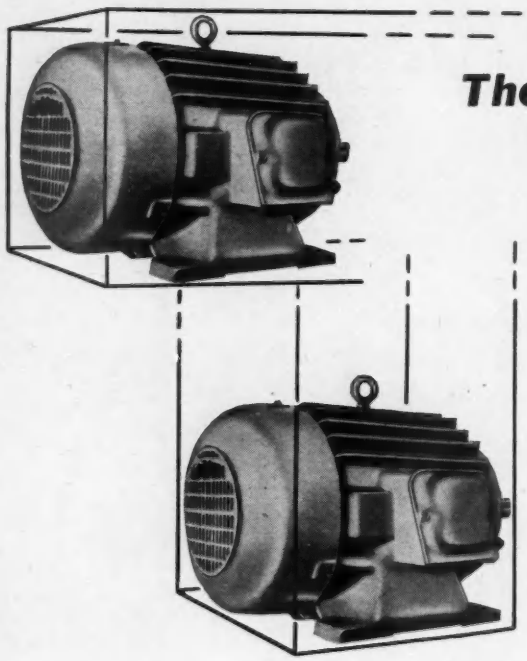
ASHATHENE is already established as cable which enables a safe and permanent electrical installation to be made in less time and at lower expenditure.
Time spent on conduit bending and screwing may be eliminated since ASHATHENE readily cleats into position along girders, walls, etc. ASHATHENE is easily manipulated and strips cleanly and quickly. You are invited to send for leaflets and technical data which deal with electrical and mechanical characteristics and notes on wiring methods. ASHATHENE is manufactured to B.S.S. 1557 in the types where this specification is applicable.

**ASHATHENE IS COMPETITIVELY PRICED THROUGHOUT THE WIDE RANGE OF ARMOURED AND NON-ARMOURED TYPES.**

# AERIALITE LIMITED

**CASTLE WORKS, STALYBRIDGE, CHESHIRE.** Depots at: London, Bristol, Birmingham, Manchester, Newcastle, Glasgow.

*This is an advertisement of the Aerialite Ltd. group of companies.* C.106 J.Y.



## *The fitting answer . . .*

Users of motors for driving machinery will probably find the answer to their standardised motor needs in the Brush 'B' range of squirrel cage, totally enclosed, fan cooled types. They are built to British Standard Dimensions (B.S. 2083, 1954) which determine all basic fixing and general physical dimensions to ensure that these motors are interchangeable with other B.S.D. Motors.
Designed and built from accumulated experience gained from over 70 years of electric motor manufacture, these sturdy machines will meet arduous conditions of service.
The range of sizes available covers from 1 to 25 h.p.

*WRITE TODAY FOR STOCK LIST*

## B.S.D. Motors by BRUSH

**BRUSH ELECTRICAL ENGINEERING CO. LTD., HOPKINSON WORKS, CARDIFF, GREAT BRITAIN**

BIRMINGHAM · BRISTOL · GLASGOW · IPSWICH · LEEDS · LONDON · LOUGHBOROUGH · MANCHESTER · NEWCASTLE · SHEFFIELD
B42

# Portrait of a member of a famous test team

Why be caught out by faulty insulation or stumped by that insulation problem. By using a "Megger" Insulation Tester you can ensure that your equipment will have a good innings.

The Series 1 instrument, illustrated above, is ideal for testing high tension equipment, insulators, transformers, motors, generators, cables, etc. Instruments are available with hand-driven generators or can be supplied with hand-and-motor drive. Ranges up to 100,000 megohms—Testing pressures up to 5,000 volts. Special 5,000 volt and 10,000 volt mains operated instruments are also available.

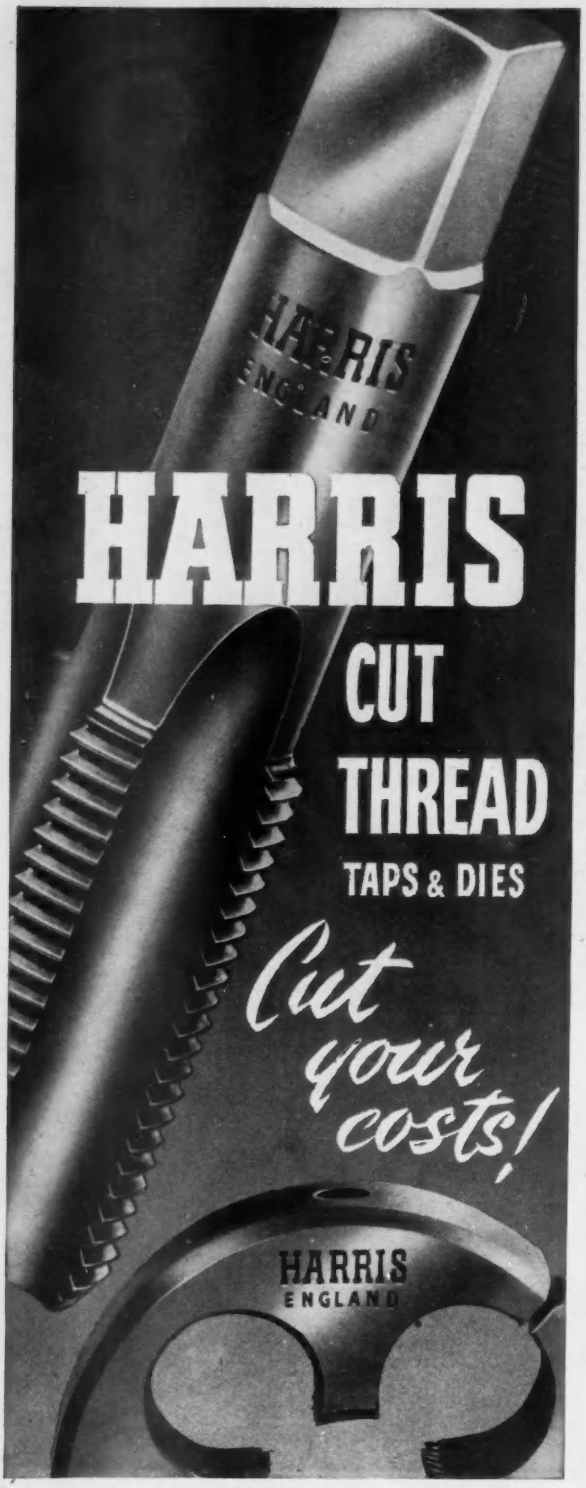
*Please write for illustrated leaflet J 051/1*

**MEGGER**
TRADE MARK

**EVERSHED AND VIGNOLES LIMITED**
ACTON LANE WORKS · CHISWICK · LONDON · W.4

*Telephone: Chiswick 3670 · Telegrams: Megger, Chisk, London · Cables: Megger, London*

6/181




**JOHN HARRIS TOOLS LTD., WARWICK**

Phone : 1041 (4 lines)

London Sales Office & Stock Room: 5, Victoria Street, S.W.1 Phone: Abbey 3730 & 5069
Glasgow Sales Office & Stock Room: 74, York Street, C.2 Phone: Central 3187

# A.C. CONDITION INSTRUMENTS

**Frequency Meters up to 5,000 cycles**

A new E.I.C. Synchroscope

In-Phase Current Meters (I x cos $\phi$) and all normal Switchboard and Portable Instruments.

*Ask for our new illustrated Catalogue.*

*Frequency Meters*

Sizes : 2½" to 8"

**ELECTRICAL INSTRUMENT CO. (Hillington) Ltd.**
**Boswell Square, Hillington, Glasgow, S.W.2**
Cables: ELINCO, GLASGOW Phone : HALFWAY 1166

*Brayhead*
**SPRINGS**
*above all*

Production manufacturers of torsion, tension and compression springs of all types, pressings, clips, I.F. cans, valve screening cans, valve shrouds, and sole manufacturers of the most advanced shock absorption device—"METPAKS" Shock Absorbers.

B4E

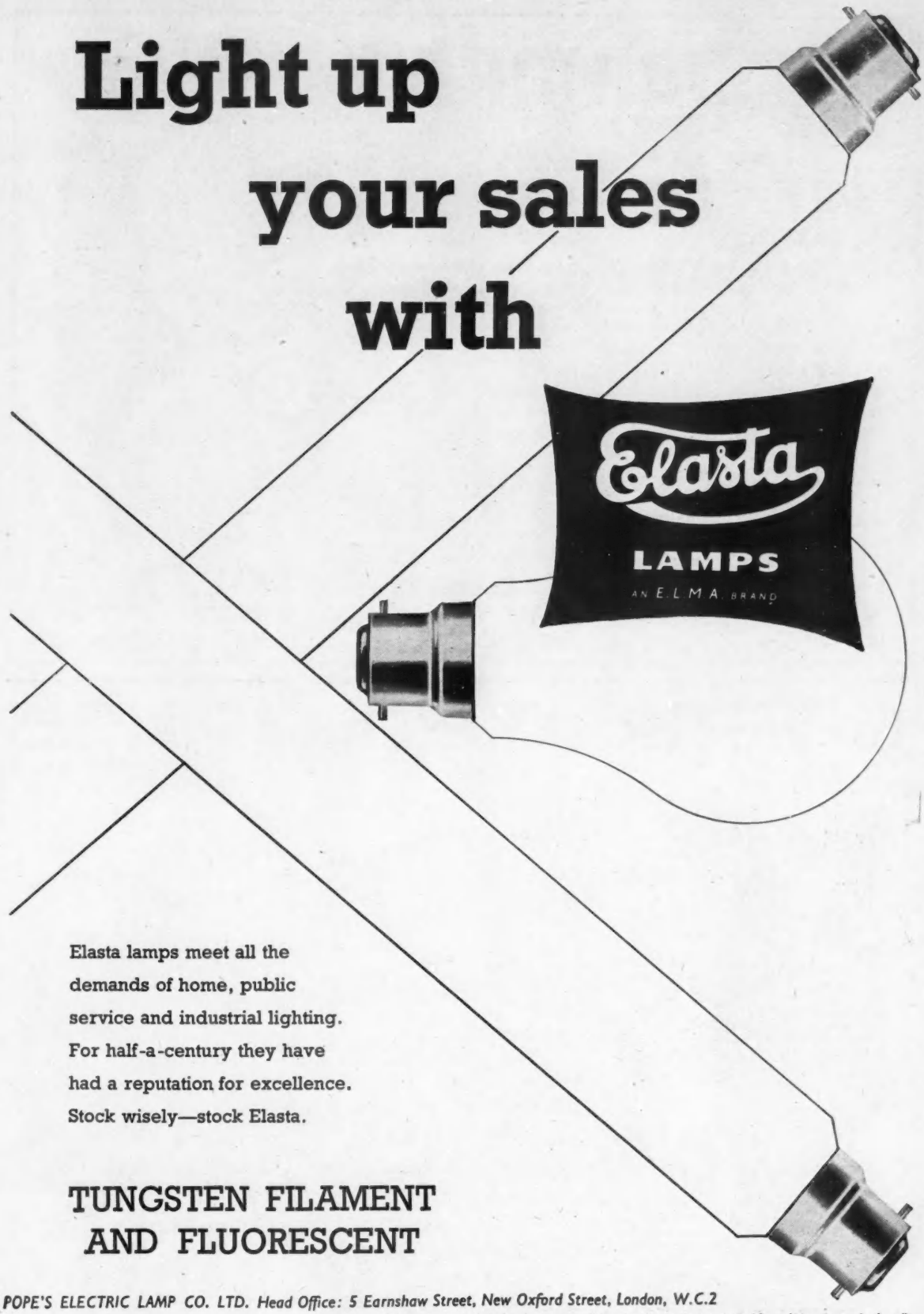
*Leading manufacturers rely on:—*

# BRAYHEAD
## SPRINGS LTD.

**FULL VIEW WORKS**
**KENNEL RIDE · ASCOT · BERKS.**

*Telephone:* Winkfield Row 427 · *Telegrams:* Brayhead Ascot

# Light up your sales with




Elasta lamps meet all the demands of home, public service and industrial lighting. For half-a-century they have had a reputation for excellence. Stock wisely—stock Elasta.

## TUNGSTEN FILAMENT AND FLUORESCENT

POPE'S ELECTRIC LAMP CO. LTD. Head Office: 5 Earnshaw Street, New Oxford Street, London, W.C.2
Branches: Manchester, Leeds, Leicester, Birmingham, Bristol, Belfast (Northern Ireland)

# DORMAN 'TS' FUSED SWITCH

*"ELEGANCE WITH EFFICIENCY"*

500 V UP TO 300 A AC OR DC

**THIS RANGE OF SWITCHGEAR INCORPORATES THE BEST MODERN PRACTICE AND DESIGN**

- ★ HRC FUSES FOR CATEGORY DUTY AC 5 OR DC 4
- ★ SILVER FACED CONTACTS HIGH PRESSURE BUTT TYPE
- ★ QUICK DOUBLE BREAK ACTION
- ★ REMARKABLE WIRING SPACE CUTS FITTING COSTS
- ★ SPACE SAVING
- ★ OWING TO THE DESIGN AND FRONT OPERATION, UNITS MAY BE MOUNTED UP TO EACH OTHER WHEN MOUNTING ON BUSBAR CHAMBER THUS REDUCING LENGTH. JUST THE JOB FOR CONFINED SPACES.

**AND ALL AT REMARKABLY COMPETITIVE PRICES**

WRITE FOR BOOKLET TSS/1

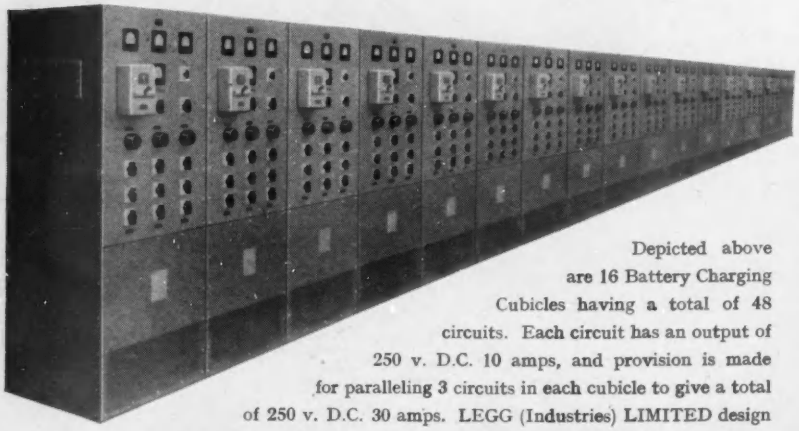
**DORMAN & SMITH LTD.**

**MANCHESTER 5**

EXPORT ENQUIRIES TO: DORMAN & SMITH LTD., 125, HIGH HOLBORN, LONDON, W.C.1



# 16 BATTERY CHARGING CUBICLES

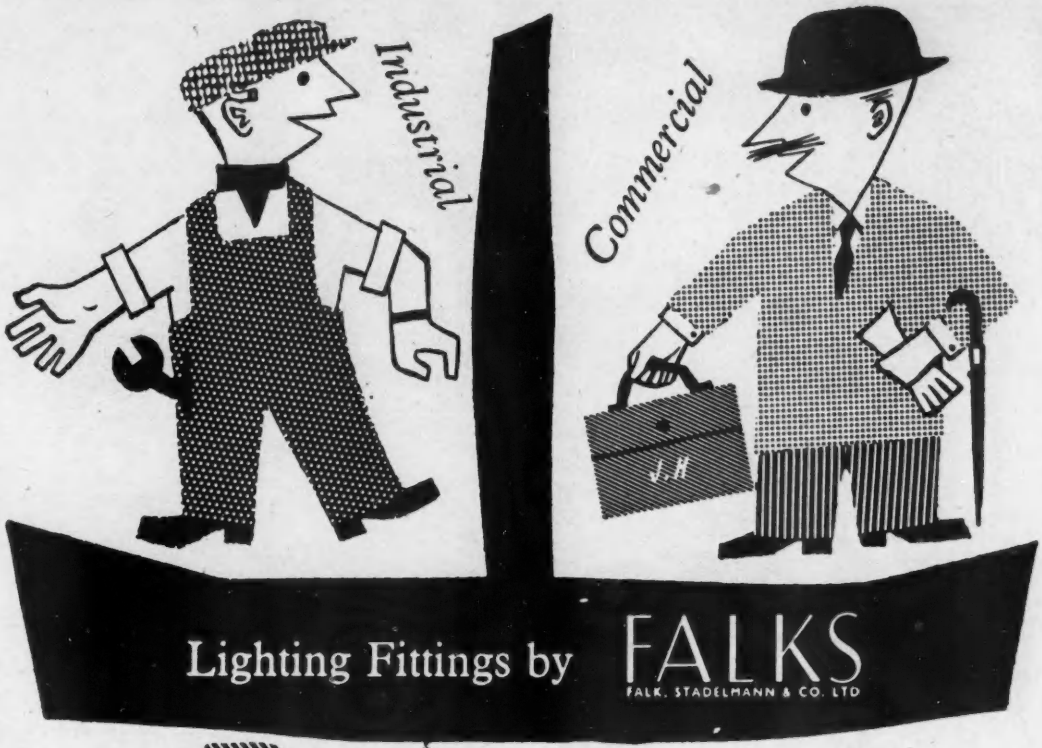


This panel has been specially designed and manufactured for an overseas customer.

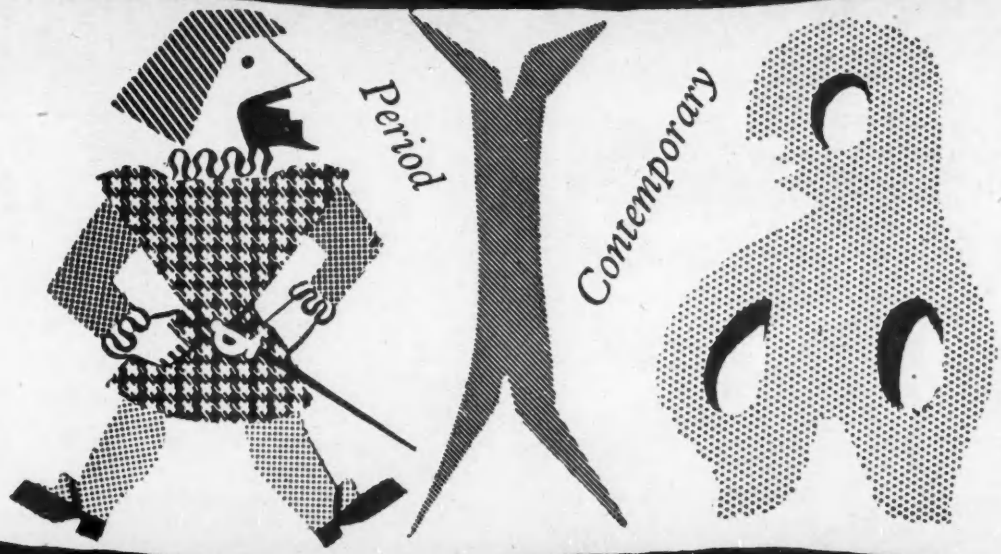
Depicted above are 16 Battery Charging Cubicles having a total of 48 circuits. Each circuit has an output of 250 v. D.C. 10 amps, and provision is made for paralleling 3 circuits in each cubicle to give a total of 250 v. D.C. 30 amps. LEGG (Industries) LIMITED design and manufacture equipment incorporating metal rectification for all purposes where a D.C. supply is required from an A.C. source, also Transformers, Air Cooled and Oil Immersed, up to 150 kVA Capacity.

A section of the rear view of 3 typical cubicles.

Legg (INDUSTRIES) LTD · WILLIAMSON ST · WOLVERHAMPTON




Lighting Fittings by FALKS
FALK, STADELMANN & CO. LTD




See the comprehensive range of electrical fittings for every industrial, commercial and domestic purpose on display at

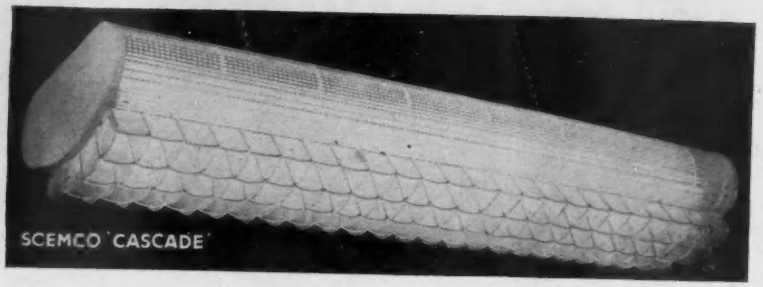
OUR SHOWROOMS

20/22 MOUNT STREET, PARK LANE, W.1. *Telephone:* MAYFAIR 5671/2

We will serve *your* customers on your behalf

AND IN GLASGOW, MANCHESTER, BIRMINGHAM, DUBLIN, CARDIFF, SWANSEA, NEWCASTLE ON TYNE, LEEDS, LIVERPOOL, BRADFORD, NOTTINGHAM, BRIGHTON, NEWCASTLE UNDER LYME, SOUTHAMPTON, EDINBURGH, ALSO OVERSEAS

FALK, STADELMANN & CO. LTD., 91 FARRINGDON ROAD, LONDON, E.C.1




*Caviare*

**or**

# BREAD and CHEESE?

. . . as with food so with
Fluorescent fittings, finesse always
attracts the better type of business

*Thus we introduce:—*

**SCEMCO "CASCADE"**
**(All Plastic Diffuser) FITTING**

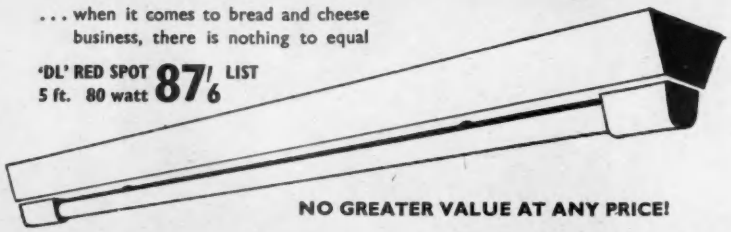
**TWIN LAMP 5 ft. 80 watt £15·15·0 list**
**TWIN LAMP 4 ft. 40 watt £14·14·0 list**
**TWIN LAMP 2 ft. 40 watt £10·17·6 list**
**TWIN LAMP 2 ft. 20 watt £10·10·0 list**

*The SCEMCO selection enables you to meet every type of demand*

*FITTINGS TO SUIT ALL REQUIREMENTS from:—*

. . . when it comes to bread and cheese business, there is nothing to equal

**'DL' RED SPOT 5 ft. 80 watt 87/6 LIST**



**NO GREATER VALUE AT ANY PRICE!**

**SCEMCO OF SOHO ST. LONDON W.1**
**TELEPHONE : GERRARD 1461**

---

# MARTINDALE
# PROTECTIVE MASK

Patent Number 479,807
Registered Design Number 819,509

Protect your workers adequately from dust and mist inhalation. Light and comfortable. Fit everybody perfectly. Weight ½ oz. Allow free breathing, clear vision, use of goggles, free speech. The workers will wear them whether watched or not. Reduce absenteeism. Do not cause perspiration or skin irritation. Always clean because pad is easily replaced.

Have given satisfaction for over 25 years and are the standard by which other lightweight masks are judged.

*Send 3/3 for Mask and 6 refills (Trial Sample) to*
**MARTINDALE ELECTRIC CO. LTD.,**
**45 Westmorland Road, London, N.W.9**
**also at 25 Elmbank Street, Glasgow, C.2**

**See us on STAND 76**
**E.I.A.**
**7th London Regional Display**
London, S.W.1
12-14 October

---

*Service &*

**ENTerprise 6222**

**AUCHTERLONIE**

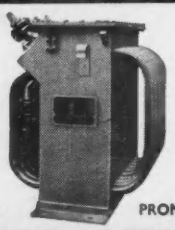
**BALL BEARINGS**
**ROLLER BEARINGS**
**PLUMMER BLOCKS, etc.**

*Immediate Delivery.* Keen Prices. Write for monthly stock list A.1

**CHAS. AUCHTERLONIE & CO., LTD.**
32 STATION RD., NEW SOUTHGATE, LONDON, N.11

---

# TRANSFORMERS



***FROM 5 V.A.—***

SINGLE AND THREE-PHASE, AIR-COOLED, ENCLOSED AND OIL INSULATED TO CUSTOMERS' SPECIFICATION

*SUPPLIERS TO: MINISTRY OF WORKS, AIR MINISTRY, BRITISH ELECTRICITY AUTHORITY*

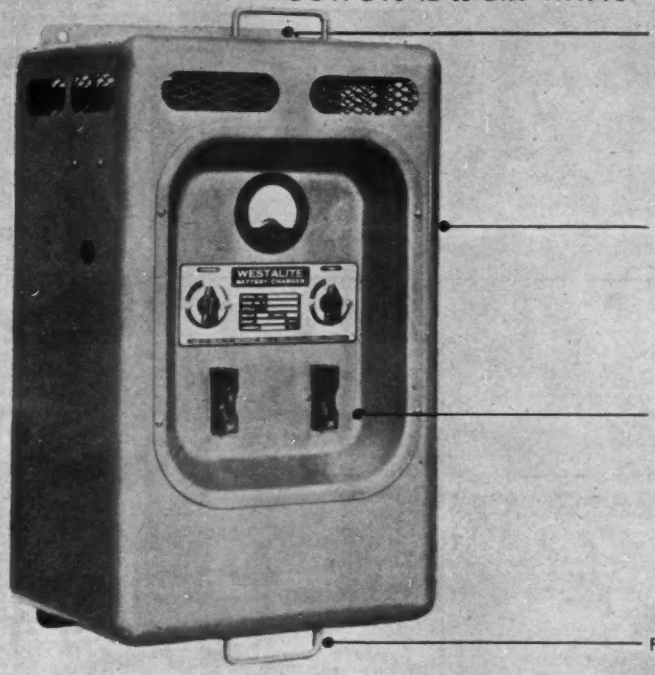
A.I.D. APPROVED

PROMPT DELIVERY **CAYSON** SEND FOR LIST T.54

**CAYSON ELECTRICS LTD : WATFORD**
London Office: ANGEL HOUSE, LONDON, N.1.
TEL: TERMINUS 0566 TEL WATFORD 7156 & 7177

# NEW DOUBLE-VOLTAGE BATTERY CHARGERS

**OUTPUTS 12 to 2400 WATTS**




WALL MOUNTING

STREAMLINED CASE
HAMMER GREEN FINISH

RECESSED METER PANEL
OBVIATES BREAKAGES

FEET FOR BENCH MOUNTING

WESTALITE

## BATTERY CHARGERS

meet the specifications of the Battery Manufacturers

- Double-voltage rectifiers for higher efficiency
- Transformer control of charging current to effect utmost economy
- Ballast, resistive or reactive depending on output, to stabilize charging current and swamp the effects of mains voltage variations
- Batteries charged "At the Correct Rate"

*Watch for announcement of New Westric Home Battery Charger*

*AVAILABLE EX-STOCK*

*Write for full details of our Double-voltage chargers to*

**WESTINGHOUSE BRAKE & SIGNAL CO., LTD.**

E.T.24

82, YORK WAY, KING'S CROSS, LONDON, N.1.

*Reliable insulation*

*Saves worry!*

*Take no chances-use*

**ROTUNDA**

INSULATING TAPES

**ROTUNDA LIMITED DENTON MANCHESTER**

WILLIAM ESTD. GEIPEL 1871 LIMITED

**CONTROL GEAR**

A.C. and D.C.

for all Industrial purposes

**STARTERS**
DIRECT ON LINE
PUSH BUTTON
REVERSING
STAR DELTA

REGULATORS
RESISTANCES
RELAYS
CONTACTORS
SWITCHES
ETC.

A full range of Standard Equipment. Special Equipment designed and made to Customers' requirements.

VULCAN WORKS · 156-170 BERMONDSEY ST · LONDON · S.E.1

SWITCHGEAR SPECIALISTS

**STATTER**

**J. G. Statter & Co. Ltd., 82 Victoria St. S.W.1**

*Industrial Counting Instruments of Merit*

SEND FOR LEAFLET No 18/7

Telephone: BOLTON 4344 (3 lines)

# NEW ELECO "PERSPEX" FITTING FOR INDUSTRIAL CONDUIT LIGHTING

## —Increases Light Output Ratio 10-15%

This new Eleco fitting (patent applied for) is efficient, versatile and economical. It can be used either open, or made completely dustproof with a diffusor cover. The reflectors are made in two grades of opal 'Perspex', whilst the covers are obtainable in three grades, including a pinspot pattern "Perspex". This means that a suitable combination can be arranged to control the percentage of upward light and brightness over a considerable area. Thus, units can be selected to give the best lighting effect for your particular installation.

## TOTAL THESE FEATURES - AND YOU GET TODAY'S MOST EFFICIENT LIGHTING

For 100 to 500 watt tungsten Lamps, 80-125 watt MB/V Mercury.

Lighting output Ratio exceeds 85%. Balanced distribution — 10-25% upward light.

High mechanical strength — Resists corrosion.

Low initial cost.

Ease of installation.

White stove enamelled interior.

*For further particulars or help on any lighting problem write to:*

ELECO

**ENGINEERING & LIGHTING EQUIPMENT CO. LTD.**

SPHERE WORKS, ST. ALBANS, HERTS.

SPECIALISTS FOR OVER 30 YEARS

METER BOARDS
SWITCH BLOCKS
SWITCH BOXES
ELECTRICAL
WOODWORK

FIRST CLASS WORK · QUICK DELIVERY · COMPETITIVE PRICES

WOOTTON & CO. LTD

ALMA WORKS, PONDERS END · MIDDLESEX · TELEPHONE: HOWARD 1858

TEC

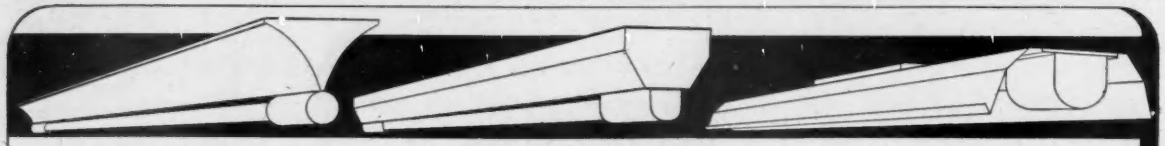
POWER & DISTRIBUTION TRANSFORMERS
C.S.A. APPROVED

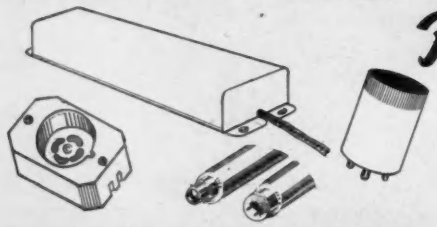
10 VA to 100 KVA Open, Enclosed, Oil Cooled, D.W. and Auto for
INDUSTRIAL ENGINEERING, FURNACES, ELECTRONICS, PHASE CONVERSION, ETC.

THE TRANSFORMER & ELECTRICAL CO. LTD.
EASTERN RD., WALTHAMSTOW, LONDON, E.17
Phone: KEYstone 5031/2

INSTRUMENT WIRES
INSULATING MATERIALS

WEST INSULATING COMPANY LTD.
2 Abbey Orchard Street, Westminster, S.W.1
Telephones: Abbey 2814 & 7352



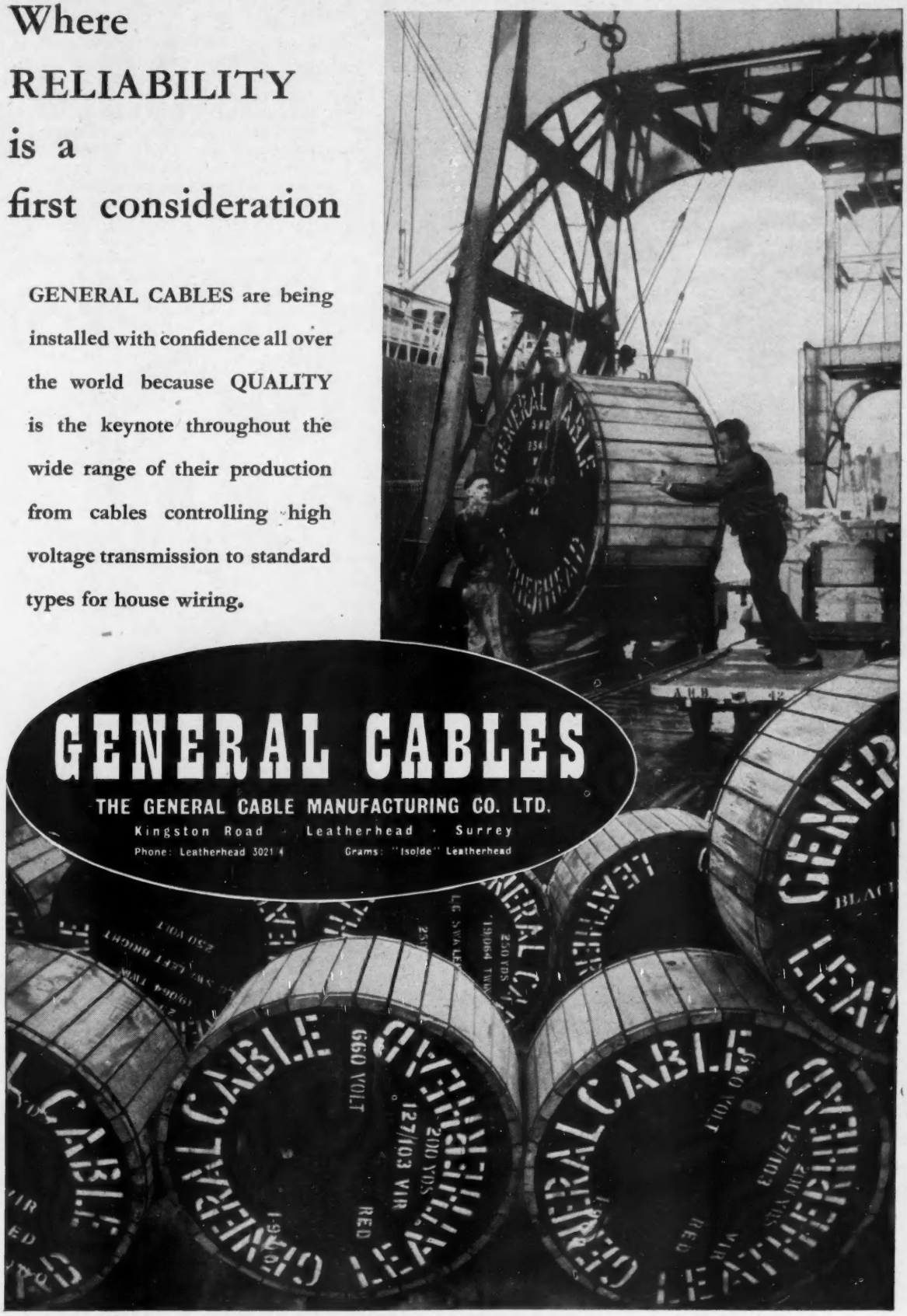


Fluorescent Lighting Equipment

manufactured by
ENSEL ELECTRIC CO., LTD.
218 UPPER STREET, LONDON, N.1
Telephone: CANonbury 2251/2 Grams: Enslectric, London
*Send for illustrated leaflets and price lists.*

# Where RELIABILITY is a first consideration

GENERAL CABLES are being installed with confidence all over the world because QUALITY is the keynote throughout the wide range of their production from cables controlling high voltage transmission to standard types for house wiring.



## There's much to be said for . . .

**CONSTRUCTION:** Toroidally wound auto-transformers, with tracks formed on one face of the windings.
**CORE:** Wound from a continuous strip of low loss electrical steel in a similar manner to the well-known C core construction.
**INSULATION:** Specially processed plastic mouldings ensure minimum shrinkage due to heat and continuous use, and prevent any possibility of the turns slackening.
**WINDING:** Of high conductivity copper, insulated with a synthetic enamel of the polyvinal acetal-phenal formaldehyde resin type, giving good space factor, exceptionally high abrasion resistance and prolonged heating resistance.
**FRAME:** Of die cast aluminium, incorporating long spindle bearings and mounting feet to ensure accuracy and rigidity of the mechanism in relation to the fixing holes.
**BRUSHES:** The brushes are of a special carbon chosen for its contact resistance characteristics, shaped to give minimum loss, maximum strength and longest life.

*There are 4 models of the Berco Rotary Regavolt available :—*

| Model | Max. Input Volts at 50/60 cycles | Max. Output Voltage Range at no load | Rated Current | Weight | PRICE £ s. |
|---|---|---|---|---|---|
| 41A | 250 | 0–250 | 0.8 | 4½ lbs. | 6 12 |
| 41B | 115 | 0–135 | 2.25 | | |
| 42A | 250 | 0–270 | 2.0 | 6½ lbs. | 7 18 |
| 42B | 115 | 0–135 | 5.0 | | |

The Berco Rotary Regavolt provides a highly economical, compact and reliable means of obtaining a continuously variable output voltage, without the heat losses associated with resistances. Its outstanding advantage over resistance control is that any alternating current load within normal rating can be controlled from zero to full voltage without the necessity of special designing for individual applications. Thus, one rotary Regavolt can be used in place of a number of adjustable resistances. In addition, an increase in voltage, above the main supply, can be obtained with three of the four Regavolt models. This is an especially valuable feature when the supply voltage is low.

## ...BERCO ROTARY REGAVOLT

BERCO

★ *For full details and prices write to:—*
THE BRITISH ELECTRIC RESISTANCE CO. LTD.,
Queensway, Ponders End, Middlesex. Telephone: HOWard 1492. Telegrams: Vitrohm, Enfield
*Specialists in the control of current and voltage for more than 25 years*

BRI251-AH

FOR FARM & FACTORY WIRING

THE NEW
# GILFLEX

FARM & INDUSTRIAL
PLASTIC CONDUIT
*WIRING SYSTEM*

★ ALL-INSULATED ★
★ NON-INFLAMMABLE ★
★ CORROSION RESISTANT ★
★ WATERTIGHT ★

**GILFLEX CONDUITS LTD**
41 THE PARADE, HIGH STREET
WATFORD · HERTS
WATFORD 3422

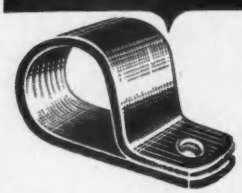
MERITUS

INDUSTRIAL
LIGHTING BRACKETS

Robust Construction both Electrically and Mechanically for
WORK BENCHES, LABORATORIES
MACHINE LIGHTS, GARAGES, ETC.
*Use in conjunction with Meritus Low Voltage Transformers*

**MERITUS (BARNET) LTD.** BARNET, HERTS
Tel.: Barnet 2291/2

**PLASKLIP** *NON-METALLIC CLIPS*



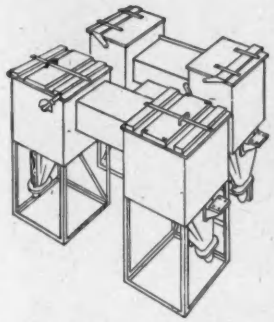
Provide the means for the correct securing of components and cable looms in radio and electrical instruments and equipment. The very extensive range covers wiring requirements generaliy. Made in high dielectric material, non-electrolytic, non-magnetic, radiused edges, fully tropical. Approved all services.

*Samples and literature on request*

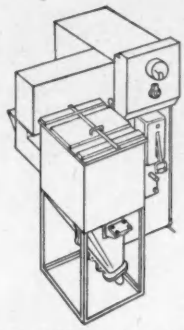
**INSULOID MANUFACTURING COMPANY LIMITED**
Sharston Works, Lessone Ave., Wythenshawe, Manchester. Tel: Wythenshawe 2842.

# ADAPTABILITY

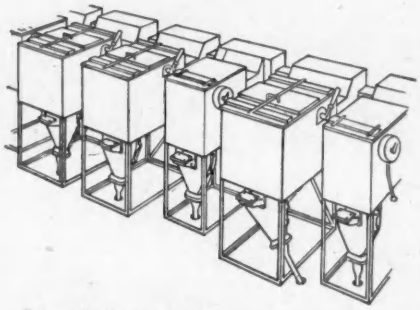
## —an outstanding feature of this NEW unit



*Non-extensible ring main arrangement*

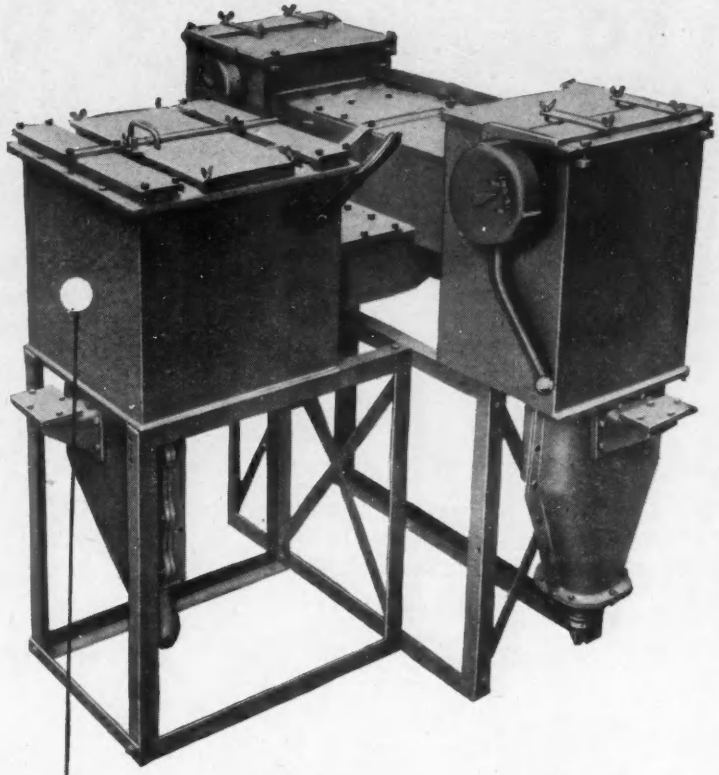


*Combined 'OFS' and metalclad circuit-breaker unit*



*Extensible 'in-line' arrangement*

*Three of the many combined arrangements of the 'OFS' fuse-switch are shown above.*



**OFS**

**OIL—IMMERSED FUSE-SWITCH**

On many occasions low initial cost is of paramount importance and does not permit the installation of the normal circuit-breaker type of HV switching equipment; to meet such cases, we are now offering the Type 'OFS' oil fuse-switch.

Designed for indoor or outdoor service this small, robust, steel-encased fully automatic unit is capable of controlling feeder and transformer circuits on 6·6 and 11 kV systems where the fault level does not exceed 250 MVA.

Fault currents are dealt with by three "trip all phases" HBC fuse-links mounted in a readily isolatable fuse carrier which is fully interlocked with a simple operating mechanism to ensure safe operation. Normal load currents can be interrupted or made on the fuse carrier contacts.

Combined with the "Ferguson Pailin" fully tested type 'IB 3' oil switch it provides an ideal ring main equipment which can be of extensible or non-extensible type. A variety of such arrangements is available to suit the cabling, operating and site layout conditions.

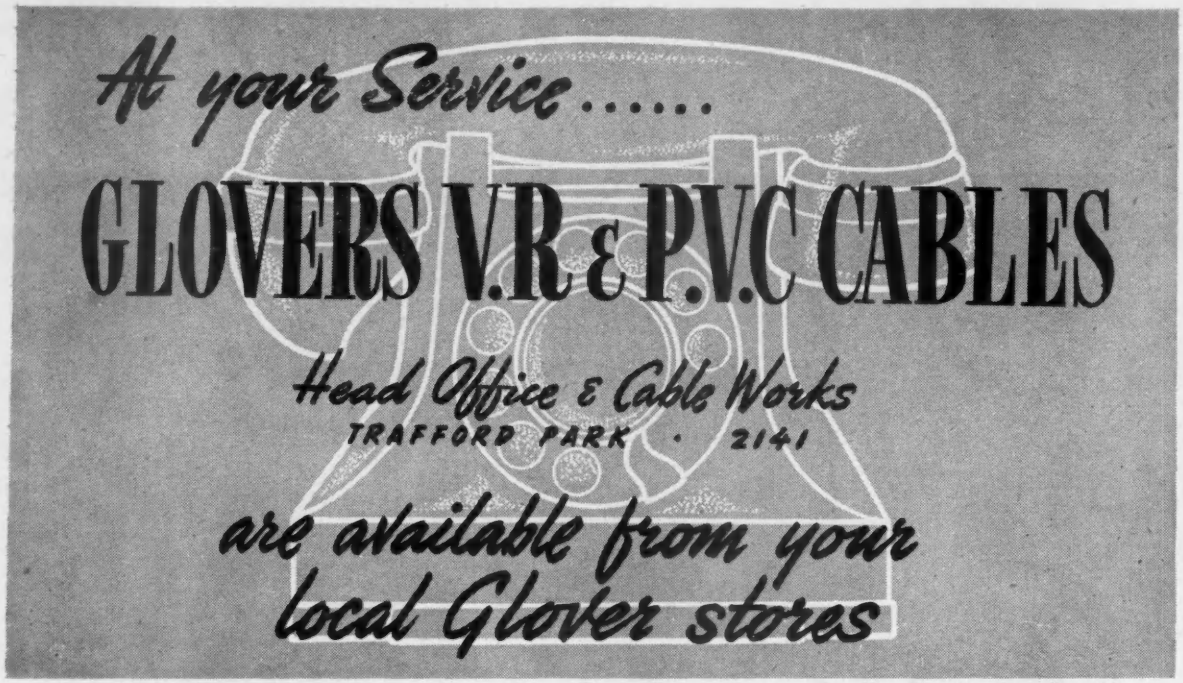
**Ferguson Pailin** LIMITED *for Switchgear*

Member of the A.E.I. Group of Companies

Head Office & Works: **HR. OPENSHAW MANCHESTER 11,** Telephone : DROylsden 1301 (Pte Branch Ex)

LONDON OFFICE : Bush House, Aldwych, W.C.2 BIRMINGHAM OFFICE : Windsor House, 656 Chester Road, Erdington, 23 GLASGOW OFFICE : Central Chambers, 109 Hope Street, C.2.

REPRESENTED IN PRINCIPAL OVERSEAS TERRITORIES



*At your Service.....*

# GLOVERS V.R & P.V.C CABLES

*Head Office & Cable Works*
TRAFFORD PARK · 2141

*are available from your local Glover stores*

**BIRMINGHAM**
17, SUMMER ROW,
BIRMINGHAM, 3.
TEL NO COLMORE 4534

**LEEDS**
BRITANNIA HOUSE,
WELLINGTON STREET, LEEDS, 1.
TEL NO LEEDS 3-1500

**PRESTON**
170, CORPORATION STREET,
PRESTON
TEL NO PRESTON 3779

**BRISTOL**
123, VICTORIA STREET,
BRISTOL
TEL NO BRISTOL 27077

**LIVERPOOL**
39, LEECE STREET
LIVERPOOL, 1.
TEL NO ROYAL 2215

**SHEFFIELD**
36, ARUNDEL STREET,
SHEFFIELD, 1.
TEL NO SHEFFIELD 21213

**CARDIFF**
8, FITZALAN PLACE
CARDIFF
TEL NO CARDIFF 30028

**LONDON**
PARLIAMENT MANSIONS,
ABBEY ORCHARD STREET,
LONDON, S.W.1.
TEL NO ABBEY 3714

**BELFAST**
ELECTRICAL EQUIPMENT CO.
38, FOUNTAIN STREET,
BELFAST, NORTHERN IRELAND
TEL NO BELFAST 29877/8

**GLASGOW**
215, WEST CAMPBELL STREET
GLASGOW, C.2.
TEL NO CENTRAL 1712-3

**MANCHESTER**
8, NICHOLAS STREET,
MANCHESTER, 1.
TEL NO CENTRAL 2439

**SOUTH EASTERN**
41 DYKE ROAD,
BRIGHTON
TEL NO BRIGHTON 23106

**IPSWICH**
9, ST. PETER'S STREET,
IPSWICH
TEL NO IPSWICH 4292

**NEWCASTLE**
34, GREAT NORTH ROAD,
NEWCASTLE-ON-TYNE, 2.
TEL NO NEWCASTLE 26857

**SOUTHERN**
57 CASTLE STREET
READING
TEL NO READING 4384

**W. T. GLOVER & CO. LTD.**
MEMBERS OF THE C.M.A
TRAFFORD PARK MANCHESTER 17
TRAFFORD PARK 2141

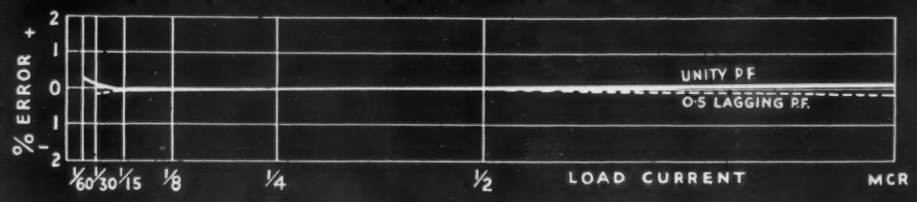

Printed in England by Staples Printers Limited at their Great Titchfield Street, London, establishment, for the Proprietors, THE ELECTRICAL TIMES LTD., and published at Sardinia House, Sardinia Street, London, W.C.2.

Denis Ferranti Group

QUALITY DELIVERY

# THE TM3 METER

LOAD CURVES UNITY & 0.5 LAGGING P.F. NORMAL VOLTAGE




**The TM3, a maximum current rating meter, is the latest development of DENIS FERRANTI METERS LTD. It complies with B.S.37, Parts 1 and 2, 1952.**

**No sliding contacts on any adjustments.**

**Voltage and current losses are low, without any sacrifice of accuracy, from M.C.R. down to less than 1/60 M.C.R.**

***The Meter with the most efficient magnet system in the world.***

DENIS FERRANTI BEST IN THE WORLD

## DENIS FERRANTI METERS LTD.

TELEPHONE: BANGOR, 860. BANGOR AND PENYGROES NORTH WALES TELEGRAMS: DEFERRANTI, BANGOR

# This meter offers you . . .

**EASY PAYMENTS BY THE CONSUMER**

**SIMPLE CHECKING**

**ACCURACY UNDER ALL CONDITIONS**

**PERFECT CONTROL AT ALL LOADS**

The Smith 'units-per-coin' prepayment meter has the immense advantage that the meter-reader can make a check simply, and with small risk of error, since the consumption, the credit and the setting are all in units. Thus :—

$$\frac{\text{CONSUMPTION} + \text{CREDIT}}{\text{SETTING}} = \text{COINS INSERTED}$$

The mechanism, too, is simple, and no matter what happens to it the meter will register accurately.

**SIMPLE TARIFF ADJUSTMENT**

★

**SINGLE UNIT CONSTRUCTION**

# SMITH A.P.R. METERS

the **PROVED** units per coin meter

**ROWAN ROAD • STREATHAM VALE • LONDON SW16**

***ALSO IN LEEDS AND DUNBLANE (PERTHSHIRE)***